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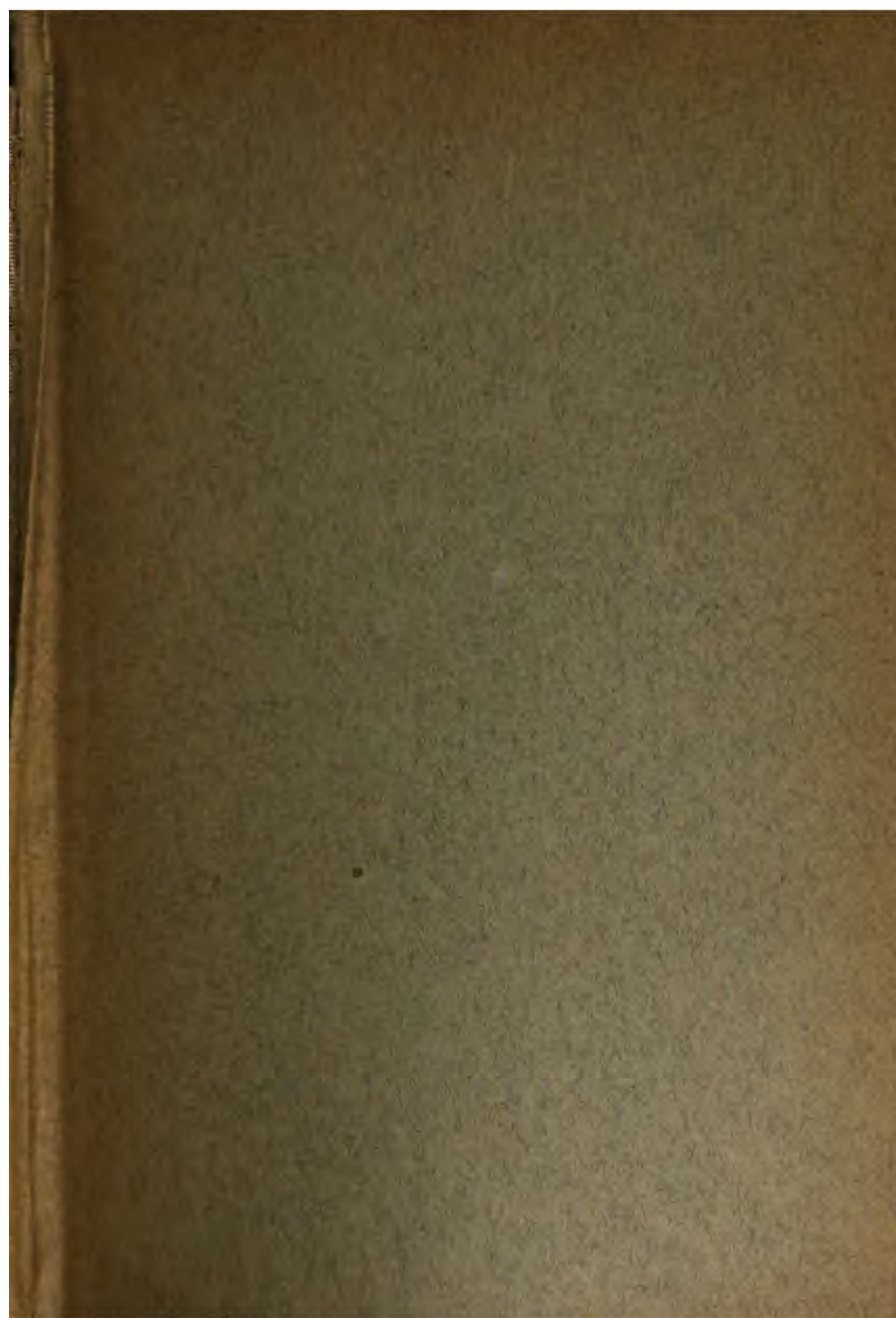
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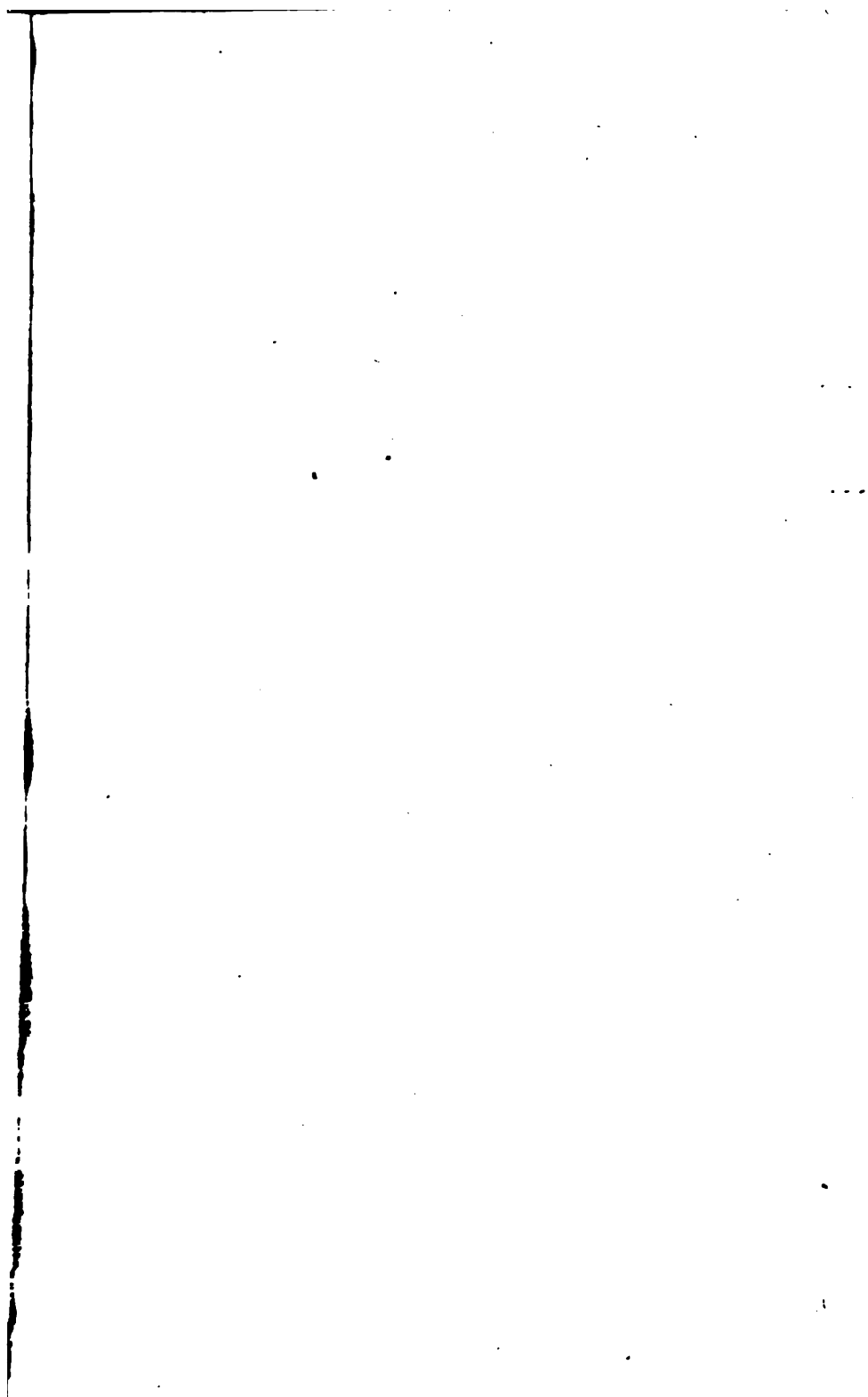
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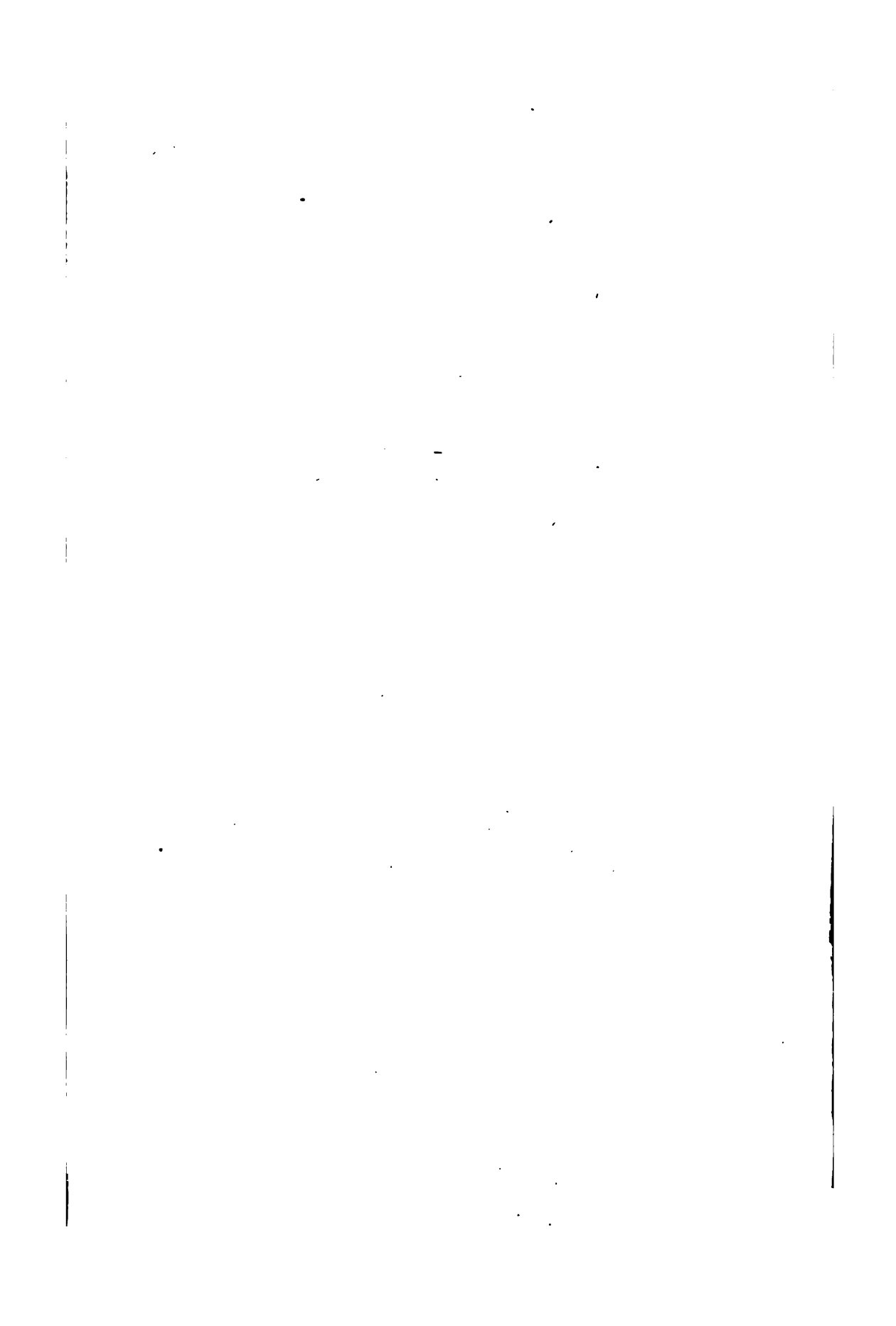


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THE COPPER HANDBOOK

A MANUAL OF THE COPPER INDUSTRY
OF THE WORLD

VOL. V

FOR THE YEAR 1904

COMPILED AND PUBLISHED BY
HORACE J. STEVENS
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1905

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Following the text of the book is an advertising section of 100 pages, carrying the announcements and cards of nearly two hundred manufacturers, dealers in mining supplies, mining companies, engineers, metallurgists, chemists, trade journals, railroads, etc., supplemented by a carefully compiled classified buyers' index.

PREFACE.

The present annual edition of the Copper Handbook, which is the fifth, is presented with mingled feelings of pride and regret—honest pride in the immense amount of hard and steady work that it has cost, and regret that the days had not more hours, in order that more work might have been done, and certain shortcomings remedied. As matters stand, the book represents a year of hard work, and if the year had been longer, more work might have been accomplished.

The two final chapters, which, collectively, include nearly five-sixths of the entire book, have been rewritten from beginning to end, and it is a source of regret to the author that the limitations imposed by lack of time have prevented similar rewriting for every chapter in the book. It was felt, however, that these were the more important chapters of the book, and also that they covered the topics, not only of most vital interest, but the matters susceptible to the greatest changes within a twelvemonth. A great mass of material from thousands of different sources has been sifted, and the facts of importance gathered therefrom, and verified, as fully as possible. As in previous editions of this book, the author expressly disclaims all pretensions to infallibility, and will thank any reader for corrections. The fifteenth chapter of the book contains no less than 3,849 titles, with from two lines to fourteen pages devoted to each, and in a work of this nature, where the statements of fact run into the hundreds of thousands, errors are inevitable. All that is claimed is that every honest effort has been made to verify the assertions given in the book, and that for every statement

of fact therein, verification or corroborative evidence of some sort can be furnished.

No other publication dealing with any branch of mining attempts to pass upon the honesty and financial responsibility of the companies listed. Naturally, an effort to separate the sheep from the goats is fraught with many dangers and difficulties, as well as great responsibility, especially in the case of a work of this nature, the scope of which is the entire globe. The work of passing upon the honesty and responsibility of the various mining companies has been carried much further this year than in any preceding edition, as a consequence of which many more companies are endorsed as honest, while a much greater number than before are denounced as unworthy of confidence. Very naturally, the men and corporations denounced in former editions of the Copper Handbook are not pleased at the unenviable notoriety given them in a publication of good standing, circulating throughout the world, but it may be said, as an evidence of the thoroughness with which this work has been done in past editions, that, notwithstanding the many threats uttered against the author of this book, ranging from simple threats of corporal chastisement to promises of suits for criminal libel, the author has yet to be thrashed, and yet to be sued, for any statement contained in the past four editions of the work.

Of the many companies denounced as dishonest or downright fraudulent in the last edition of this book, not one has been able to prove its right to a better rating than was accorded it, though a number have made attempts to secure such ratings, by methods ranging from covert bribery, through legal proceedings, down to threats of physical violence. Of the many companies endorsed as honorable in the past four annual editions of the Copper Handbook, just one, the American Mining, Milling & Smelting Company, has been found dishonest. It is a source of deep regret to the author that this utterly putrid concern, domiciled in London, succeeded in securing

a good rating in Volume IV of this work, but the task of keeping track of several thousand corporations, located in all parts of the world, is no small one, and the erroneous opinion expressed in the last volume regarding the company in question, was given through an error of judgement, and not an error of intent.

The work of preparing the present edition has been greatly facilitated by the hearty co-operation of a great number of individuals, firms, corporations, societies and governments. Statistics have been furnished freely by a great majority of the officials of the various governments of whom requests were made. It is hoped that for next year even the Turkish government may be induced to reply to requests for information, though as yet the Imperial Minister of Forests and Mines of the Ottoman Empire has not been brought to reply to any of the numerous letters written him during the past four years. The mining companies have responded more freely and fully to requests for information for the present volume than in any preceding year, and especial thanks are due a large number of engineers, in all parts of the world, for their kindly criticisms, advice and voluntary submission of facts of interest.

Like its predecessors, Volume V of the Copper Handbook has been written along systematic lines. Every effort has been made to group the facts given in logical order, and to avoid needless duplications, though, necessarily, the final statistical chapter contains much matter previously given, scattered through nearly four thousand descriptions of as many different properties. The index has been prepared with care, and by its use almost any feature desired may be located easily. The titles of the mines and mining companies are not indexed, for the reason that Chapter XV, giving the mine descriptions, is in full alphabetical order, consequently self-indexing, thus saving nearly forty pages of double-column index that would be required for the mine titles alone.

At the rear of the volume will be found a large number of advertisements, for which the consideration of the reader is asked. The cost of preparing the volume is so great that the enterprise would not be self-sustaining but for the advertisements, unless the price were doubled, which, in turn, would cut down the circulation of the work, which is now believed to be the largest enjoyed by any mining annual. Instead of scattering the advertising throughout the book, where its presence is undesirable, and of doubtful value to the advertiser, it has been collected in a single section, at the end of the work. Every advertisement has been passed upon, and to the best knowledge of the publisher is that of a thoroughly reputable firm. Advertising offered from doubtful concerns has been refused, it being intended to keep the advertising pages as clean and reliable as the text of the book.

HORACE J. STEVENS.

Houghton, Michigan, U. S. A., May 2, 1905.

THE COPPER HANDBOOK

CHAPTER I.

THE HISTORY OF COPPER.

The discovery and utilization of copper occurred at a period so remote that even legendary accounts are lacking. A semi-authentic narration of the facts connected with the discovery of iron on Mount Ida has been handed down to us, yet there were copper mines worked on this same mountain in Asia Minor before the alleged date of the discovery of iron. The earlier history of the useful metal is surrounded by the same myths as cloud the story of mankind in general in days so far remote. There seems good reason to think that copper and tin, in the form of bronze, an alloy of these two metals, was in general use before the discovery of the process of producing iron from its ores. Such was unquestionably the case with the primitive peoples of Northern and Western Europe. In Asia Minor, the scene of the earliest civilization known to archaeologists, many weapons, implements and ornaments of bronze have been found in buried cities of seven to eight thousand years of age. On the American continent the aboriginal peoples were unacquainted with the use of iron, but the richer and more advanced nations had great stores of copper, gold and silver. The latter metals, found in profusion in Mexico and Peru, were utilized mainly for ornaments and decorative architecture. There being no important tin deposits as yet developed in the new world, and there being no evidence that tin was mined on the North and South American continents before their discovery by Europeans, it seems altogether probable that the aboriginal American races were totally unacquainted with bronze and brass. However, copper itself was used extensively. It was mined from Lake Superior deposits of native metal in very considerable quantities, and was distributed at least as far south as Mexico, and to practically all parts of the territory now constituting the United States. The date at which this mining was done is variously estimated at some hundreds to many thousands of years ago. The Chippewa Indians were in possession of the southern shore of Lake Superior when it was visited by the first white explorers, the intrepid Jesuit missionaries, Rene Mesnard and Claude Allouez, early in the Seventeenth century; Father Mesnard, the first white man to set foot on the shore of the

great fresh water sea, having lost his life a few miles from where the greatest copper mines of Lake Superior are now developed. The Chippewas were then unacquainted with any of the practical uses of copper, though possessing a few small masses of the native metal, saved apparently for the same reason that impels a child to collect bright colored bits of broken glass. The Indians not only made no practical use of copper, but were unacquainted with the use of any other metal. As extensive mining operations were formerly carried on in the district held by the Chippewas in the middle of the Seventeenth century, the last actual mining must have been done at least several hundred years earlier, or some oral traditions would have been handed down. "Whether the mining was done by ancestors of the aboriginal tribes discovered in possession of the Lake district by the earliest white explorers, or by some antecedent people of higher civilization, is a point that archaeologists and ethnologists are still arguing. Whatever may have been the derivation or fate of that pre-historic race of copper miners, vaguely termed "Mound Builders," it is certain that they enjoyed at least a rudimentary civilization, and were successful metallurgists, for they possessed the art of tempering copper. Weapons for the chase and war and domestic utensils of good finish and style, and highly tempered, are dug from mounds and found in sand dunes along the southern shore of Lake Superior from time to time. "In this connection, it may be observed that many zealous metallurgists, mostly of the amateur stripe, are wasting much time in efforts to re-discover the "lost art" of tempering copper. Sundry fairly successful processes for tempering copper are now known to scientists, but the art, even if again brought to its pristine perfection, would be of no great benefit, as steel and iron are much cheaper than copper, and far preferable for any ordinary use to which tempered copper could be put.

From the earliest dawn of history, copper and gold seem to have been in common use among the more civilized nations, the yellow metal for ornaments and as a medium of exchange, and the ruddier one for weapons and implements, usually in the form of an alloy, as brass or bronze. The ancient world of Grecian and Roman days possessed considerable stores of copper, and mines were regularly worked. There are apparently good reasons for believing that the Phœnicians knew of the tin and copper deposits of Britain at a period as remote as 1,000 B. C. Spain was the source of the principal copper supplies of the Roman empire, although other fields were also worked to some extent. Spain has been furnishing copper to the world for nearly three thousand years, and remains one of the principal sources of the world's copper supply.

During the dark period of the middle ages, mining, while not a lost art, was certainly not followed as systematically and successfully as during the more prosperous and enlightened era of Roman dominion. The world's supply of gold and silver decreased from century to century, owing to the losses from attrition and misplacement not being made good by the quantities mined. Iron, being subject to rust, was mined and smelted as required, although the production was surprisingly small. It is probable that the

United States Steel Corporation now turns out in every working day more iron than was produced in all Europe in a full year, at the period of greatest darkness during mediæval times. The supply of copper during the middle ages must have been very small, but the science of statistics was not then in vogue, in a period when a king was called *Beauclerc*—good clerk—because he could write his own name without the guiding hand of a monk.

When Europe awoke from the lethargy and sodden life of the dark ages, in the Fifteenth century, the use of the metals began growing, and this growth has continued, with few interruptions, to the present day. The tin and copper mines of Cornwall became sources of great wealth to their titled owners, and the mining of copper was stimulated in Germany, Norway and other European countries. In the Eighteenth century copper mining was started in the American colonies of Vermont and New Jersey. In the Sixteenth century copper was discovered in Mexico and several parts of South America, but the Spanish conquistadors were more anxious for the gold of the Peruvian Incas, and the silver from San Louis Potosi, than for the cheaper metals.

At the beginning of the Eighteenth century the English mines, in Cornwall, were making much the largest part of the world's copper, and even at that date were of such considerable depth and with such extensive underground openings that the problem of disposing of the water was of the most vital importance. Many good mines were allowed to remain idle, solely because the expense of keeping them free of water was greater than the profits of operation. The first steam engine was built for a Cornish mine, the Wheal Por, by a Captain Savery, very early in the Eighteenth century. It was but a partial success, and the plan was improved on by Newcomen, who erected a pumping engine at the Wheal Fortune mine, Cornwall, in 1720. The Newcomen steam engine was a crude and wasteful device, according to the standard of the present day, but it was much more effective than hand and horse power, or a water wheel, and was used in many of the larger Cornish mines for fifty years or more, until the genius of Watt brought forth the modern steam engine—an engine that a century and a quarter has been unable to improve upon in essential plan, though many and great betterments have been made in details. It should be said, however, for Savery and Newcomen, that crude as were their steam engines, the pumping plan followed by them was essentially sound, and the Cornish pump, first made by Savery nearly two hundred years ago, and improved a little later by Newcomen, is still the basic model for the Cornish mine pumps, scattered over the habitable world, wherever there are mines.

The first Watts engine was erected at Chacewater, Cornwall, in 1777, and proved a great success. It came none too soon, as the larger mines, deepened by reason of the aid given from Newcomen's pumps, were at a depth where the first crude engines could no longer give satisfactory results.

Although steam power was first applied to copper mining nearly two centuries ago, it was used only for handling water until after the beginning of the Nineteenth century. The first application of steam power to

other mining uses was in the first or second decade of the Nineteenth century, when a hoisting drum was first actuated by steam.

At the beginning of the Eighteenth century Great Britain was making at least three-quarters of the world's copper. The Cornish mines produced 4,923 tons of refined copper in 1799, and the Welsh mines of Anglesea made nearly 2,000 tons in the same year. The great Mansfeld mine, in Germany, made only 372 tons in that year, and only estimates are obtainable for the products of other countries. Spain's output was insignificant, and the United States made but a few tons. Russia and Japan probably ranked next in importance after England as producers, and Austria, Norway, Sweden, Italy and several other nations made small contributions to the world's copper stock. Australia, South Africa and Canada were then unknown as sources of copper supply. It is a notable fact that one hundred years ago, the mines of the United States, Spain, Chile, Mexico, Canada, South Africa, Australia and Tasmania, which now make about 90 per cent. of the world's copper, were either totally undeveloped, or else producers of but a few tons each, while Great Britain, which made almost 7,000 tons of copper in 1799, produced but 550 tons in 1899.

For the first half of the Nineteenth century, Great Britain maintained its position at the head of the world's copper producers, but the latter half of the century was a period of ever increasing depression, relieved by only occasional years of prosperity for the British copper mines. The invention of the Watts engine and its application to pumping machinery enabled the mine operators of Cornwall and Anglesea to penetrate to depths theretofore undreamed of. In 1790 the Dolcoath mine in Cornwall was 600 feet deep; in 1816 it was down 1,368 feet, and in 1830 the Tresavean mine, also of Cornwall, reached the great depth of 1,920 feet. As the mines increased in depth rapidly, various improvements became necessary. The old method of raising ore in baskets carried up ladders on the backs of men and women was replaced by whims, operated first by hand, then by horse power, later by water wheels, and eventually by steam. Around these whims were coiled the ropes that hoisted ore in wicker baskets. A little later the hempen ropes were replaced by wire cables, and the baskets gave way to iron skips and cages. In 1842 the first man engine was built, for taking men to and from their work in the deep mines. Mine surveying was introduced, and machinery employed in the mills, where hand work had been the rule for centuries. The Anglesea mines enjoyed great prosperity for the first quarter of the century, but gave unmistakable signs of exhaustion a few years later, and in the fourth decade ceased to be important factors in the world's copper industry. The smelters of Wales had attained such growth, however, that Swansea still remains the seat of one of the greatest and most diversified smelting industries of the world.

It was in the fourth decade of the last century that the competitors destined to destroy the English copper mining industry first began coming to notice. The copper discoveries in the Lake Superior district were made at about the same time as copper in workable quantities was found

in Australia, but the Australian mines were of slow development, and have never grown to be of great importance, while the Lake Superior mines soon became the largest of the world. The first actual copper mining at Lake Superior was done in 1844, and the first product secured was a few tons of oxide ore—not native copper—taken from a fissure vein near Copper Harbor, Keweenaw county, by the Pittsburg & Lake Superior Mining Company, which later developed the Cliff mine, nearly twenty miles to the southwest. The Minnesota mine in Ontonagon county was opened shortly after, and since that time the Lake Superior copper industry has enjoyed a large and fairly steady growth.

Beginning in the early fifties, the Chilean copper deposits were systematically developed and Chile has become one of the world's greatest producers. The Tharsis mine in Spain, was re-opened in 1863. It was in the sixties that the competition of cheaper copper from richer mines first begun to be felt most severely in Cornwall, resulting in the closing of one mine after another, until today, the Cornish mines in active operation are few in number and their profits trivial.

The awakening of Japan by Commodore Perry in 1854 was succeeded by a period of angry contempt for foreign manners and methods on the part of the Japanese, but this was followed by the revolution wherein the shogun was deposed and the mikado became the actual instead of the merely nominal ruler of the island empire. The introduction of foreign methods has been followed by the industrial awakening of Japan, and the Japanese mines are now sources of copper supply of great importance, and even greater promise.

In 1866 the Calumet & Hecla was opened and speedily took first rank among the copper mines of the world. In 1876 the great Rio Tinto mines of Spain were reopened, after a century of idleness. The Moonta and Wallaroo mines were opened in Australia at about the same time as the Calumet & Hecla, and Tasmanian copper deposits first attracted attention in the same decade, though no considerable production was secured until nearly twenty years later.

In 1880 the Butte camp of Montana, now the greatest copper producer of any district in the world, was discovered. Butte was originally a placer gold camp, and the first Butte copper mine, the Anaconda, was opened for silver, and eventually became the largest copper producer of any of the world's mines. In the latter eighties, South Africa developed several good mines; the Boleo and other Mexican mines became prominent, and the first great mines of Arizona were opened.

The beneficial influence of the copper industry upon the mining and metallurgical methods of the world has been most marked. The first smelting was probably done from copper ores. The Bessemer process is used in copper refining as well as in the making of steel. Many important advances in metallurgical processes have been contributed by copper smelters, and of these, the latest, and perhaps the greatest, is electrolytic refining, which will be found treated of more extensively in the chapter on metallurgy.

The United States maintains the lead won some years ago in the production of copper, and continues to supply considerably more than half of all the copper mined in the world. The promise of a number of important new fields, in Mexico, Canada and elsewhere, is such that the relative production of the United States may show a slight decrease in the near future, though the actual production will continue to increase for some time to come. Of the various fields of the United States, the Lake Superior district, although the oldest, has made substantial gains for each of the past three years, and promises to increase its production, though at a somewhat slower rate of gain, for several years to come. The Butte district of Montana is about holding its own. Like the Lake Superior district, Butte is now feeling the effects of deep mines and decreased copper percentages in its ores, but this has been met by the installation of the most modern and powerful hoisting, dressing and smelting equipments. Continuance of the unfortunate litigation that has been the bane of the Butte camp for some years past prevents the operation of many mines to more than a portion of their true productive capacity. There is no indication of an end to the litigation in Montana, and until some sort of a settlement is reached, Montana copper production is not likely to show any material increase or decrease.

Arizona is gaining ground rapidly, and in time will certainly lead both Michigan and Montana in copper production. The Yavapai county field has barely held its own in production for several years past, but should show an increase from now on. The Gila county mines are also about stationary as regards production, but their prospects are improving. Graham and Cochise counties both show heavy increases, and will make even greater gains in the near future. At present the production of these counties is practically equal, but it is probable that Cochise county will make the greater gain during the next two or three years, though both are certain to materially increase their outputs. There are also copper developments of promise under way in Pima, Pinal, Maricopa and other Arizona counties.

Utah is forging to the front as a producer. The Bingham camp is beyond question one of the important copper districts of the world, and will eventually make several times the present output. Beaver county has had too much booming and not enough mining, but the Cactus will become a large producer, and there are other properties of promise that will make good mines, when worked as mines and not for stock-jobbing purposes.

Wyoming should become a steady producer in 1904. The work done heretofore has been mainly of a preliminary nature. The Encampment and adjoining districts of Carbon county have a large number of little mining companies, many of which must drop out of sight, while the stronger will doubtless absorb the weaker and form a number of regularly producing mines. Idaho, Washington and Oregon have a number of prospects of greater or less promise, but are only small producers. California, which has copper in nearly every county, has been retrograding in production for several years past, but is again increasing its output. Nevada lacks regularly producing mines

and Colorado still makes its copper as a by-product from the mining of gold, silver, zinc and lead ores. New Mexico has not become the large producer so frequently predicted, though possessing copper deposits of more than average promise.

Alaska, from which have come such great tales of cupriferous wealth, will become a regular copper producer in 1904, but the metal will be made, not from the interior mines, about which so many lies have been told, despite their undoubted richness, but from the ores of Prince of Wales Island, on which there are several properties that promise to make rich mines.

In the eastern and southern states the Tennessee Copper Company is the only producer of real importance, and the results secured at that property prove that profitable mines can be developed in the Appalachians. There is more or less work under way in North Carolina and Virginia, where some good mines should be opened in time, and a little work is in progress in Vermont also.

In Canada the Boundary district leads in production and importance. The development of paying mines on the enormous low-grade deposits of this district proves the field of great importance. There are richer ores along the Pacific coast, where considerable work is in progress. In eastern Canada the Sudbury field is rather quiet, and the production of Quebec, Nova Scotia and New Brunswick is insignificant. Newfoundland remains practically stationary so far as production is concerned, but may show an increase soon.

In Mexico there are copper mining developments of vast importance. Mexico is now making more copper than any other country except the United States, having passed Spain in production. The Greene Consolidated and Boleo remains the principal mines, but there are a dozen others of importance, in process of development. Sonora, lying just south of Arizona, is an especially promising field.

El Cobre mines, in Cuba, are being reopened by a strong American company. These mines were large producers during the Nineteenth Century, up to 1868, when wrecked by a revolution.

The Chilean mines are not gaining in production as rapidly as had been hoped. The reopening of the Cerro de Pasco mines of Peru on a modern scale is the most important mining work now under way in South America. Bolivia's production remains practically stationary. Important developments are in progress in the Mexicana district of Argentina. The unsettled political conditions in Venezuela and Colombia prevent the development of properties known to be of great promise.

The Hispano-Portuguese mines show a slight falling off in production, due mainly to the partial exhaustion of several old mines that have been large and steady producers for many years. The copper resources of Spain are so enormous that an increase in output is but a matter of time. German copper production shows small change. Italy and Russia continue to produce without marked gain. Norway shows a substantial increase, and, next to Spain, is perhaps the most promising European copper field.

In Asia the copper production is insignificant, outside of Japan, which continues to increase its output. The Japanese mine-owners have expended large sums in betterments during the past few years, and now have better mining and smelting equipments than ever before. China has some important copper measures, worked in a small way, and in time the Chinese empire should become a highly important producer of the red metal.

In Africa the only producing mines of importance are in Little Namaqualand, Cape Colony, and these are decreasing in output. There are developments of the utmost promise under way in the interior of Africa, especially in Rhodesia, and along the coast of German Southwest Africa. While these mines, in a new country, cannot become producing factors of importance for some years, they are reasonably certain to take high rank in time.

In Australasia the Mt. Lyell mine of Tasmania remains the largest producer. There is considerable activity, however, in several states of Australia, more especially in New South Wales and Queensland. The copper resources of Australia are enormous, and if that commonwealth can be cured of its crazy socialistic notions, good progress can be made.

The era of copper manipulation, beginning in 1899 and ending early in 1902, was marked by unnaturally high prices, greatly restricting consumption, followed by abnormally low figures that caused the speedy absorption of the large surplus of metal stored up by reason of unduly high prices. The course of the metal market during 1903 was more regular and more free from manipulation than since 1898, but the suspicions of purchasers remain active. Having suffered from previous interference with the law of supply and demand in the copper market, it is but natural that they should fear further tactics of the same sort, and weigh the evidence at hand quite closely, before making market commitments.

The best interests of producers and consumers alike will be served by a perfectly natural market, in which the level of prices is determined by the supplies on hand and the consumptive capacity of purchasers. Copper consumers are prone to think that the abnormally high prices of 1899-1901 were secured solely at their own cost, yet as a matter of fact the producers suffered also, to no small extent, from the selfsame inflation. By reason of the unduly high prices then ruling, many new mines were opened, to compete with those already developed, and their competition, brought about by the era of high prices, became effectual after prices had dropped sadly. Not only this, but the cost of producing copper advanced materially by reason of the high market price. Costs were increased, not only through higher wages paid workmen, but by reason of a general slackening of vigilance in guarding small leaks, it seeming impossible for any corporation to be as careful in good times as in an ordinary season. It has taken the better mines several years to get back, even partially, to the vantage ground of costs occupied before the era of boom prices that began in 1898.

CHAPTER II.

THE GEOLOGY OF COPPER.

In this chapter no attempt is made to give more than the merest outline of the geological features of special interest, pertaining to copper. Geology is, at best, largely an empirical science. From its very nature it can never be made such an exact science as chemistry and mineralogy have already become. This is said in no carping spirit of criticism against the exponents of scientific geology, for their work is of a highly valuable nature, and if the geological dogmas of the present day contain a greater amount of assumption in proportion to ascertained and demonstrable fact than is found in cognate branches of scientific research, the empirical nature of a considerable part of the geology taught at the beginning of the Twentieth century is due to the inherent difficulties of the subject, rather than to any desire of geologists as a whole to assume more than can be proven. Just as a forest of scaffolding is erected around the walls of a great cathedral, while building is in process, so a false-work of theory is indispensable in geological research. Behind the great mass of temporary timbering the granite walls of truth are rising, slowly but surely, and as they rise, the scaffolding that once was necessary becomes useless, and is discarded.

Rocks are divided into three geological classes, the igneous, sedimentary and metamorphic. The igneous rocks, fused by subterranean fires and ejected in sheets by volcanic action, or oozing forth from cracks in the earth's crust, may be divided into granitic, porphyritic and vitreous forms. The sedimentary rocks were deposited by the action of water, usually on beds of former seas. The detrital material so deposited formed conglomerate, shale, sandstone and limestone strata, and in the case of the three first named, the material for sedimentary beds was necessarily obtained principally from the breaking down of the older igneous rocks. Strata of igneous and sedimentary rocks frequently alternate in the older geological groups. The metamorphic or third class, consists of altered rocks of the igneous and sedimentary forms, in which the phenomena of crystallization and replacement have been brought about subsequent to their deposition.

The Devonian system of the Paleozoic group was long regarded as the home of copper, possibly because of the preponderant importance of Cornwall and Devon as sources of copper supply until the middle of the Nineteenth century. Copper is more widely diffused over the earth in rocks of the Permian series of the Devonian system than in any other series of rocks, and the Permian strata are of very extensive occurrence. The Jura-Trias system of the Mesozoic, or age next younger than the Permian, is also

prolific in copper. While the Permian beds show more or less copper in most places where outcropping extensively or carefully developed, the percentage of copper contained is apt to be small, though the aggregate of copper so deposited is past computation, owing to the dissemination of the ores through beds that are of vast area.

While native copper is of very frequent occurrence, and is noted in most cupriferous districts, the virgin metal is usually an alteration product, and of little commercial importance. In the Coro Coro district of Bolivia and the Keweenaw district of Lake Superior, native copper is found in such quantities as to permit of its extraction upon an immense scale. The Bolivian copper is found in two adjoining conglomerates, composed mainly of argillaceous sandstones, and of somewhat uncertain geological age. The Lake Superior copper occurs in conglomerate and amygdaloid beds, probably of the Azoic group, though the exact geological horizon is still a matter of dispute. The native metal is most frequently found in eruptive zones, at the various points where it occurs in very considerable quantities, in the sedimentary rocks, such as conglomerates and sandstones, or in the trappean rocks of igneous origin, and more especially in the metamorphosed traps. As an alteration product, native copper may occur in the altered or oxy-carbonate zone of any copper ore body.

The source from which copper came and the manner of its deposition are largely matters for conjecture, though certain features bearing on these questions are fairly well established. The metal and its ores are in all likelihood of igneous origin, coming to the earth's surface or to its crust with the molten magma forced upward from unknown depths. As to the manner of its deposition in veins or beds, there are many theories, of which those most commonly held may be divided into two classes, the first holding that the metal and its ores were deposited in various rock strata and veins from solutions, while the second set of theories is built upon the primary thesis that copper—and other minerals—were deposited by electro-chemical action from sea water, in which process the remains of living organisms are presumed to have played an important part. Both theses have certain corroborative evidences, and both have weak spots. It is possible that ore deposits have come from both sources. It is certain that the sea holds nearly all metals in solution, but, on the whole, the theory of deposition from subterranean solutions seems the most easily tenable.

The more common metals are found as component parts of many ordinary igneous rocks, though in such small quantities that these rocks cannot be considered as ores of even the lowest grade. It is possible, and indeed probable, in the light of the limited amount of exact knowledge now possessed on this point, that subterranean and slightly carbonated surface waters percolating through the various rock strata, very few of which are impervious to water, leached out certain soluble constituents, and that the minerals, so carried in solution, were deposited, usually in crystallized form, in the brecciated rocks and in the numerous cracks in the crust and upper strata of the earth. Carbonic acid, oxygen and sulphur have been the princi-

pal reducing agents, carbonic acid gas in water being a powerful solvent. The action and inter-action of these three prime agents, assisted by other reagents set free by them, have caused complex reactions, many of which have been figured out to theoretical perfection, while not a few supposedly natural reactions have the corroborative evidence afforded by synthetical chemical experiments that have given the reactions first established theoretically. In the case of the rich iron ores of the Lake Superior district, their concentration from leaner ores by purely natural means is no longer open to question, except from the ultra-skeptical.

A third theory, once generally held, but now in disfavor, remains to be noted. This is the idea that electrical action caused the deposition of the metals. While the theory now finds few adherents, I must venture the opinion, at the risk of being considered fossilized, that electrical action has played a most important part in the deposition of many metalliferous beds. There are really but two sciences, one being mathematics, which is abstract and perfectable, while the second is the science of the concrete, embracing all matter and its various manifestations. For convenience, the realm of science, an empire vaster than Alexander swayed or Napoleon planned, has been divided into so-called sciences and groups of sciences, but the boundary lines are merely arbitrary abstractions, and have as little physical existence as the equator or the meridians of longitude. Geology shades imperceptibly into mineralogy, which in turn merges into chemistry, dynamics, optics, and electricity. All sciences are interwoven, and electricity, a manifestation of one of the attributes of matter, is an integral part of every other concrete science, from geology to biology, affecting alike the organic and inorganic kingdoms. It is probable that terrestrial magnetism, percolating waters and precipitation from superincumbent seas all played a part in the formation of ore deposits, operating under chemical, thermo-dynamical and electrical conditions of which we now have merely a slight theoretical knowledge. Mother Nature filled the recesses of her myriad subterranean treasure-houses with the wealth that man now wrests from her by brute strength, and the little craft he has been enabled to acquire in the prolonged struggle.

In connection with the foregoing remarks upon the influence of electricity on mineral deposits, it may be remarked that there are puzzling magnetic earth-currents in the Lake Superior native copper districts, these being especially marked upon Isle Royale, where the variation of the magnetic needle is remarkable. It is to be hoped that these phenomena will be given the careful scientific investigation that their importance warrants, at some not distant date. Shortly after the laying of the first Atlantic cable, Ayers Stockley, still a resident of the Lake Superior district, performed some highly interesting experiments in subterranean telegraphy. His apparatus was home-made, but he succeeded in telegraphing for some miles along one of the magnetic currents traversing the cupriferous strata of Ontonagon county, with the crude but effective instruments of his own devising.

It is still a matter of dispute whether many of the great bodies of

chalcopyrite and cupriferous pyrite and pyrrhotite are veins or beds. Recent investigation leads to the belief that many of the deposits formerly called beds are in reality entitled to the appellation of veins.

The great predominance of sulphide ores of copper is a notable fact, 75 per cent. of the world's production of the metal coming from ores of this class. It is probably safe to assume that all, or practically all, copper ores were originally sulphides. Chalcopyrite is generally held to be a product of crystallization from fusion. Eventually the upper portions of these chalcopyrite and bornite ore bodies were altered, in the case of the older deposits, mostly to oxide and carbonate ores. In all likelihood this alteration came about from the action of water. The subterranean waters found in all rock strata at greater or less depth, are not oxydizing, but the surface waters have an affinity for carbonic acid, and, carrying this gas in solution, these surface waters, percolating through the rock strata and veins, attack the sulphide ores, which gradually yield up sulphur and become carbonates and oxides, through chemical reactions induced by carbonic acid. For this reason the permanent water level of a mine usually marks the lowest depth at which oxide and carbonate ores are found, and below this point the ores are nearly always sulphides, with a strong tendency toward lower percentages of copper and higher percentages of iron, as depth is gained.

As chalcopyrite and bornite (compound sulphides of copper and iron) are overwhelmingly the most common ores of copper, and, below the permanent water level, practically the only copper ores, the alteration of these iron-copper sulphides to oxide and carbonate ores (or sometimes to silicates, or the higher sulphides of copper alone) by the action of percolating surface waters, charged with carbonic acid, necessarily sets free one atom of iron for each atom of copper dissociated from the original chemical union, in which one atom each of copper and iron were united with two atoms of sulphur. The iron also forms carbonates or oxides, most usually the latter, and, in the form of limonite, a hydrated sesquioxide of iron, is carried upward in the waters, and stains the rock above or near the surface of the original deposit of chalcopyrite. The characteristic rusty-iron stain of limonite is a prominent feature of the rock-capping surmounting many of the largest copper ore bodies, and this "gossan" or "iron hat" is a welcome sign of copper values below, in nearly every copper-ore mining district of the world. It is not an invariable sign, however, as it is necessarily lacking in many places, such as at imbedded deposits having no outcrop, and unaltered sulphide ore bodies, also at points where the original capping has been removed by surface erosion or glaciation. The gossan may also be found at many points where copper does not lie beneath, but, as a rule, a capping of gossan is a highly favorable sign in a cupriferous district.

The rich oxide and carbonate ores existing at and near the surface in most copper-bearing districts (except in the native copper fields) may safely be considered alteration products from the chalcopyrite and bornite ores found at greater depths. The silicates, phosphates and other ores are probably alteration products also, as are the higher sulphides of copper in which

iron is not present, unless as an impurity. In some districts the unaltered sulphides extend to the surface, but this is the exception rather than the rule. The depths to which the carbonate and oxide ores may extend is dependent upon local conditions, and ranges from a few feet to more than one thousand feet. As a rule, the oxide and carbonate and richer sulphide ores (such as chalcocite) give way to unaltered sulphides of copper and iron at the permanent water level. In cases, not so very common, where the altered ores exist below the water level, it is presumed that the alteration occurred during some antecedent age or ages, when the water level was lower, or the rock strata higher. The native copper deposits remain absolutely unaltered in nature or quantity below the water level, which apparently has no effect upon deposits of the virgin metal.

In this place, it may not be amiss to insert a few words of warning and advice to those lacking extended experience in copper mining. It is undoubtedly true that a geologist of high scientific attainments may make a poor fist at practical mining. Possibly this rule may be considered proven by the brilliant exception recently made by Dr. L. L. Hubbard, who stepped direct from the position of state geologist of Michigan to the general management of a corporation owning undeveloped lands, and within a few months opened what must become one of the greatest copper mines of the world within the next few years. On the other hand, the practical miner to whom is entrusted the development of a new copper mine, may profit greatly by bearing in mind a few facts that are not only geological maxims, but proven by innumerable practical illustrations. It is certain that copper mines—always excepting those producing the native metal—are subject to greater changes with depth than mines of any other class. All mines vary more or less, in width of productive openings and in the values found therein, as depth is gained, but copper ore mines, while varying in width and values with depth just like mines of other metals, are subject to a special series of variations, an understanding of which is of prime importance to owners and managers. In strong veins, where iron-copper sulphides are first encountered, a continuance of the vein to a considerable depth, with comparatively slight alteration, may reasonably be looked for. This does not apply to gash veins, of course, as these are invariably shallow, but the experienced miner is not likely to long mistake a gash vein for a true fissure. In other cases, where the surface openings show rich oxides and carbonates, or chrysocolla and similar ores, it should always be borne in mind that these ores cannot prove permanent. They may extend downward for a few score feet only, or possibly may hold for many hundreds of feet, but sooner or later they will give way at depth to unaltered iron-copper sulphides, as will copper glance or other high-grade ores. The oxides and carbonates, from their richness in metal and the ease with which they may be smelted, are highly desirable ores, and have been the making of many good mines that otherwise would have proven failures, through affording profits with which to open more extensive bodies of lower grade ore at greater depth, and to build and equip the large

and costly smelters required for successful treatment of the iron-copper sulphides.

For the reason that a change at depth is inevitable, it is highly important that a new copper mine having high-grade surface ores should prove its property before forming a permanent plan of mining, smelting and financial conduct. This can be done in one way only, and that is by probing the ground. The probing may be done by diamond drills, or by sinking shafts. Diamond drilling is a wonderful aid in exploring new territory, but at best it is only a sort of blind-man's-buff. As a preliminary measure diamond drilling is highly commendable, but for a certainty the shaft or tunnel is the thing. Where a mine is already opened on rich copper ores, sinking is the proper course. This will determine the extent of the richer ore bodies and the nature of the unaltered sulphides. At times highly profitable oxides and carbonates are replaced by sulphides of too low grade to work at a profit. More frequently the richer ores are replaced at depth by sulphides that can be profitably worked, provided a sufficiently extensive mechanical and metallurgical equipment is supplied. As a rule, the better a copper mine at surface, the better at depth, but there are such important exceptions that development is the only safe guide.

For the reasons set forth in the foregoing paragraphs, it is important that the management of a copper ore mine have more than a surface knowledge of its property before laying out permanent plans. Handsome profits may be earned from surface and sub-surface ores, but if these be paid out in dividends as quickly as earned, the change in the ore, certain to come at some depth, may leave the company with a depleted treasury to face the problem of raising large sums for development and equipment. Shareholders will pay assessments more readily on a new or developing mine than on one that has been a dividend payer. In connection with the advice contained in the preceding paragraphs, there are sections in the chapter on metallurgy of interest to those lacking experience who may be responsible for the development of new mines. To the experienced mining men I am not offering advice. Such men are always seeking for information to add to their already extensive stocks, but they do not hanker for advice.

The various chapters on the ore deposits of the world will be found to contain a great amount of geological matter of a more specific nature than given in the preceding pages, and geological data of a still more detailed nature will be found in many of the descriptions of mines. In the chapter on chemistry and mineralogy there are detailed descriptions of the physical and chemical characteristics of the metal and its various ores and minerals, of which the principal, from an economical standpoint, are native copper, chalcopyrite, bornite, chalcocite, malachite, azurite, tenorite, cuprite and chrysocolla.

CHAPTER III.

CHEMISTRY AND MINERALOGY OF COPPER.

In the following pages will be found a list of the ores and alloys of copper, with brief descriptions, the detail depending somewhat upon the importance or special interest possessed. The native metal itself is included in the list, which also gives the synonyms of the principal copper ores.

No attempt has been made to render this chapter exhaustive, despite its considerable length. Readers desiring further and more detailed knowledge of the various ores, including their optical properties, complete pyrognostics and crystallization, are referred to the standard works on mineralogy. It is believed, however, that the pages appended may prove of some assistance to the general reader interested in the subject of copper, and possibly will interest the scientist as well, because of being the first encyclopædic list of exclusively copper minerals ever published.

Following is a list of the elements with which copper is found chemically united in nature. This list includes 29 of the 77 elements known to science at this writing. Following the name of each element is its chemical symbol and atomic weight, as now figured by the best authorities.

Element	Symbol	Atomic weight	Element	Symbol	Atomic weight
Aluminum	Al	27.1	Nitrogen	N	14.04
Antimony	Sb	120.	Oxygen	O	16.
Arsenic	As	75.	Phosphorus	P	31.
Bismuth	Bi	208.3	Platinum	Pt	195.
Calcium	Ca	40.1	Selenium	Se	79.2
Carbon	C	12.	Silicon	Si	28.4
Chlorine	Cl	35.45	Silver	Ag	107.93
Cobalt	Co	59.	Sulphur	S	32.06
Copper	Cu	63.6	Tellurium	Te	127.5
Hydrogen	H	1.01	Tin	Sn	119.
Iron	Fe	56.	Tungsten	W	184.
Lead	Pb	206.9	Uranium	U	240.
Manganese	Mn	55.	Vanadium	V	51.4
Nickel	Ni	58.7	Zinc	Zn	65.4
Niobium	Nb	93.7			

The elements with which copper unites most frequently are as follows, in approximate order of frequency and preference: Sulphur, oxygen, carbon, arsenic, antimony, bismuth, silica, chlorine, phosphorus, nitrogen, selenium, wolframium (tungsten), uranium, and vanadium.

The ores of copper (alone or with other metals), may be divided into the following groups:

Antimonides	Oxides	Sulphoarsenites
Arsenates	Oxychlorides	Sulphides
Arsenides	Phosphates	Sulphates
Arsenites	Selenides	Sulphobismuthites
Carbonates	Selenites	Tellurides
Chlorides	Silicates	Tungstates
Molybdates	Sulphoantimonates	Uranates
Niobates	Sulphoantimonites	Vanadates
Nitrates	Sulphoarsenates	

An alphabetical list of copper minerals, and alloys, including native copper and synonyms, is appended.

ADAMITE. Essentially a hydrous arsenate of zinc, but copper may replace the zinc to extent of from a trace to 23.5% cupric oxide.

AIKINITE. PbCuBiS_3 . Common names: Needle ore, acicular bismuth. Copper 11%, bismuth 36.2%, lead 36%, sulphur 16.8%. Orthorhombic. Crystals embedded; acicular, striated; also massive. Fracture: Uneven. Hardness: 2 to 2.5. Gravity: 6.1 to 6.8. Luster: Metallic. Color: Blackish lead gray, tarnishing to pale copper red. Opaque. Fuses on charcoal. Soluble in nitric acid. Occurrence: Ural Mountains of Russia, and Gold Hill, North Carolina, U. S. A.

ALASKAITE. An argentiferous galena-bismuthite in which lead is partially replaced by silver, 3.25% to 8.75%, and copper 3.5% to 5.1%, with traces of zinc, antimony and iron.

ALGODONITE. Cu_3As . Copper 83.5%, arsenic 16.5%. Occurrence: Chile and Lake Superior.

ALISONITE. A sulphide of lead and copper. Probably $3\text{Cu}_2\text{S}$, PbS .

ALUMINUM BRONZE. An alloy of copper and aluminum.

AMMIOLITE. Antimonite of copper and mercury. Cupric oxide 15.5% to 18%.

ANDREWSITE. A phospho-silicate of copper, iron, manganese and aluminum. About 11% cupric oxide.

ANNIVITE. A bismuthiferous stibio-arsenate of copper, carrying about 4% iron and 2% zinc. A complex mineral of the tetrahedrite-tennantite family.

ANTIMONIAL COPPER. Chalcostibite.

ANTLERITE. A basic sulphate of copper with traces of zinc and calcium; chemical formula uncertain, contains cupric oxide 67% to 68%.

APHTONITE. A tetrahedrite carrying silver, iron and zinc.

ARNIMITE. 5CuO , 2SO_3 , $+6\text{H}_2\text{O}$. Copper 45.5% to 48%.

ASPEROLITE. Probably CuSiO_3 , $3\text{H}_2\text{O}$. Same as chrysocolla, except in excess of water.

ATACAMITE. $\text{Cu}_2\text{ClH}_2\text{O}_2$. Copper 15.9%, cupric oxide 55.8%, chlorine 16.6%, water 12.7%. Cleavage: Imperfect to perfect. Fracture: Conchoidal. Brittle. Hardness: 3 to 3.5. Gravity: 3.75 to 3.77. Luster: Adamantine to vitreous. Color: Emerald to blackish green. Streak: Apple-green. Transparent to translucent. Occurs as sandy granules in the province of Atacama, Chile, where first discovered, also at many other points. A valuable ore of copper where found in commercial quantity.

ATELITE. A hydrated cupreous bi-chloride, $2\text{CuO}, \text{CuCl}_2 + 3\text{H}_2\text{O}$. From crater of Vesuvius, apparently at pseudomorphs after tenorite, and nearly the same as atacamite chemically.

ATLASITE. A copper chloro-carbonate apparently between atacamite and malachite. From Chanarcillo, Chile.

AURICHALCITE. $2(\text{ZnCu})\text{CO}_3, 3(\text{ZnCu})(\text{OH})_2$. A basic carbonate of copper and zinc. Carries about 21% cupric oxide. Monoclinic in acicular crystals, forming drusy incrustations; also columnar, laminated and granular. Hardness: 2. Gravity: 3.5 to 3.6. Luster: Pearly. Color: Pale green to sky blue. Streak: Light green to light blue. Translucent. Soluble in acids. Occurs in small quantities at numerous points.

AZURITE. $3\text{CuO}, 2\text{CO}_2, \text{H}_2\text{O}$. Common names: Blue carbonate of copper, azure copper ore. Monoclinic; also massive to earthy. Cleavage: Perfect, but interrupted. Fracture: Conchoidal. Brittle. Hardness: 3.5 to 4. Gravity: 3.77 to 8.83. Luster: Vitreous. Color: Azure blue. Streak: Lighter blue. Transparent to subtranslucent. Soluble in nitric acid. A fairly common ore of copper.

BARNHARDTITE. Apparently a chalcopyrite partly altered to chalcocite, by loss of part of iron content. Assays 47% to 50% copper and 20% to 22.5% iron.

BAYLDONITE. A hydrous arsenate of copper and lead, carrying about 26% copper.

BELL-METAL ORE. Stannite.

BERZELIANITE. A selenide of copper, Cu_2Se . Copper 61.6%. Part of copper replaced with silver at times.

BEUDANTITE. A complex and somewhat uncertain arseno-phosphate or phospho-arsenate of iron, copper and lead, with sulphates of the metals present in varying quantities. Contains 8.5% to 12.3% cupric oxide.

BINNITE. $3\text{Cu}_2\text{S}, 2\text{As}_2\text{S}_3$. Copper 39.2%. Carries also a little lead, iron and silver.

BJELKITE. A cupriferous cosalite.

BLANCHED COPPER. An alloy of copper and arsenic.

BLUESTONE. Sulphate of copper. Blue vitriol. Chalcanthite.

BOGOSLOVSKITE. Apparently an impure chrysocolla, carrying carbon dioxide.

BOLEITE. Apparently a variety of percyllite carrying chloride of silver. Has 14% to 15% copper, 48% to 51% lead and about 9% to 10% silver. From Boleo mine, Mexico.

BORNITE. Cu_3FeS_4 . Copper 55.5%, Iron 16.4%, sulphur 28.1%. Common name: Peacock copper ore. Isometric; many hexagonal penetration twins. Habit, cubic. Massive. Structure: granular or compact. Fracture: Small conchoidal, uneven. Brittle. Hardness: 3. Gravity: 4.9 to 5.4. Luster: Metallic. Color: Copper red to bluish brown, quickly tarnishing to iridescence. Streak: Pale grayish black. Opaque. Soluble in nitric acid with separation of sulphur. Occurrence: In most of the important copper fields of the world. Uses: The second most important ore of copper.

BOURNONITE. PbCuSbS_4 . Copper 13%, lead 42.5%, antimony 24.7%, sulphur 19.8%. Massive; granular and compact. Crystals, orthorhombic. Cleavage: Imperfect. Fracture: Subconchoidal to uneven. Rather brittle. Hardness: 2.5 to 3. Gravity: 5.7 to 5.9. Brilliant metallic luster. Color and Streak: Steel gray, inclining to blackish lead-gray or iron black. Opaque. Fuses easily on charcoal. Decomposed by nitric acid. Occurrence: Hartz Mountains and Saxony, Bohemia, Hungary, Carinthia, Cornwall, Chile, Bolivia, Peru, Canada, Arkansas, Colorado, etc.

BRASS. An alloy of copper and zinc, about 2 parts copper to 1 of zinc.

BROCHANTITE. A basic sulphate of copper. $4\text{CuO} \cdot \text{SO}_3 \cdot 3\text{H}_2\text{O}$, carrying 70.3% cupric oxide.

BRONZE An alloy of copper and tin. The varying proportions give differing colors and qualities, such as bell-metal, medal bronze, gun-metal, etc.

CACHEUTAITE. A selenide of lead, copper and silver, with occasional traces of cobalt and iron, carrying 7% to 36% copper.

CALCIOVOLBORTHITE. A hydrous vanadate of copper, calcium, magnesium and manganese. Copper 30% to 35%.

CALIDONITE. A basic sulphate of lead and copper. Chemical composition uncertain. Cupric oxide about 10%.

CANTONITE. A dimorphic variety of covellite crystallized in cubes, with cubical cleavage.

CAPILLARY RED OXIDE OF COPPER. Cuprite.

CARROLLITE. $\text{CuS} \cdot \text{Co}_2\text{S}_3$. Copper 20.5%, cobalt 38%, sulphur 41.5%. Occurrence: Carroll county, Maryland.

CASTILLITE. A bornite of uncertain formula, carrying approximately, copper 41%, zinc 12%, lead 10%, silver 4%, iron 7%.

CHALCANTHITE. $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$. Common names: Blue vitriol, bluestone, sulphate of copper. Carries about 25% copper. Triclinic. As crystals, also massive, stalactitic and reniform, sometimes with fibrous structure. Luster: Vitreous. Color: Sky blue. Subtransparent to translucent. Soluble in water. Solution will deposit metallic copper on iron.

CHALCOCITE. Copper glance. Cu_2S . The richest sulphide ore, carrying copper 79.8%, sulphur 20.2%, also frequently iron or silver in small quantities. Orthorhombic: Also massive, with structure granular to compact and impalpable. Cleavage: Indistinct. Fracture: Conchoidal. Somewhat brittle. Hardness: 2.5 to 3. Gravity: 5.5 to 5.8. Luster: Metallic. Color and Streak: Blackish lead-gray, tarnishing to dull green or blue. Opaque. Soluble in nitric acid. Occurrence: In nearly all sulphide copper districts of the world in small quantities, occasionally in considerable bodies. Uses: The richest commercial ore of copper.

CHALCOPYRITE. CuFeS_2 (or $\text{Cu}_2\text{S,Fe}_2\text{S}_2$). Copper 34.5%, iron 30.5%, sulphur 35%. Frequently mixed with pyrrhotite; occasionally carries gold or silver. Tetragonal; sphenoidal, often twinning; also frequently massive and compact. Fracture: Uneven. Hardness: 3.5 to 4. Gravity: 4.1 to 4.3. Luster: Metallic. Color: Brass yellow, often tarnishing to iridescence. Streak: Greenish black. Opaque. Soluble, except sulphur, in nitric acid. On being heated yields up a portion of its sulphur. On exposure to moisture and heat becomes hydrated, and copper and iron change readily to sulphates. Occurrence: In every copper field of importance. The most common ore of copper, and the source of nearly 75% of the world's supply of the metal.

CHALCOMENITE. A hydrous selenite of copper. $\text{CuSeO}_3 + 2\text{H}_2\text{O}$. Carries about 35% cupric oxide and 48% selenium dioxide.

CHALCOPHYLLITE. A highly basic arsenate of copper; formula given variously—simplest is $7\text{CuO,As}_2\text{O}_5,14\text{H}_2\text{O}$. Percentage of cupric oxide 44.5% to 53%.

CHALCOPYRRHOTITE. Fe,CuS_2 . Copper 13%, iron 48%, sulphur 38%. Occurrence: Cuba and Sweden.

CHALCOSIDERITE. $\text{CuO, 3Fe}_2\text{O}_3, 2\text{P}_2\text{O}_5, 8\text{H}_2\text{O}$. Cupric oxide about 8%.

CHALCOSINE. Chalcocite.

CHALCOSTIBITE. $\text{Cu}_2\text{S, Sb}_2\text{S}_3$. Essentially a sulpho-antimonide of copper, carrying about 25% copper, 48% antimony, 26% sulphur, with 1% to 2% iron and occasionally a fractional percentage of lead.

CHALCOTRICHITE. A form of cuprite with capillary or acicular crystallization.

CHENEVIXITE. A hydrous arsenate of copper and iron, formula uncertain. Cupric oxide about 26.3%.

CHESSY COPPER. Azurite.

CHILENITE. Probably Ag_2Bi , with copper replacing silver to extent of about 7%.

CHIVIATITE. A sulphide of lead and bismuth in which lead is partly replaced by copper to extent of about 2.5%. Occurrence: Chivato, Peru.

CHLOANTHITE. Empirically NiAs_2 , a diarsenide of nickel. In analyses invariably shows cobalt and iron, and frequently traces of copper

bismuth, antimony, lead and silver. The ease with which partial replacement of the nickel is effected in both chloanthite and smaltite calls attention to the minerals kweenawite and mohawkite, which, though lower in the series of arsenides, are very properly described by Dr. Koenig, the discoverer, as compound arsenides; the formula being written (CuNiCo) . The same formula might be used to advantage with chloanthite, smaltite and sundry other arsenides of protean forms.

CHLOROTILE. $\text{Cu}_3\text{As}_2\text{O}_8 + 6\text{H}_2\text{O}$. Carries about 32.5% copper. A hydrous arsenate of copper. Orthorhombic; fibrous and massive. Soft. Color: Pale emerald green. Transparent.

CHRYSOCOLLA. $\text{CuSiO}_3, 2\text{H}_2\text{O}$. Carries about 36.1% copper. Common name: Mountain green and Mountain blue. Cryptocrystalline, enamel-like. Sometimes botryoidal. Fracture: Conchoidal. Brittle and somewhat sectile. Hardness: 2 to 4. Gravity: 2 to 2.24. Luster: Vitreous to earthy. Color: Mountain green, bluish green, sky blue to turquoise blue. Impure varieties, brown to dull black. Streak: White from pure varieties. Translucent to opaque. Decomposed by acids without gelatinization. Occurrence: Frequently with other ores, especially in upper portions of veins.

CLARITE. Probably a dimorphous form of enargite.

CLAYITE. A stibio-arsenate of lead, with lead replaced to extent of about 8% copper and a trace of silver.

CLINOCLASITE. $6\text{CuO}, \text{As}_2\text{O}_5 + 3\text{H}_2\text{O}$. Carries 48% to 50% copper. A hydrous arsenate of copper. Cleavage: Highly perfect. Brittle. Hardness: 2.5 to 3. Gravity: 4.19 to 4.36. Luster: Vitreous to resinous. Color and Streak: Bluish-green. Subtransparent to translucent. Soluble in nitric acid. Occurrence: Cornwall and Utah.

CONDURRITE. A soft, black copper ore, found in Cornwall; supposed to be an alteration product of tennantite.

CONICALCITE. An arsenate of copper and calcium, carrying occasionally zinc and vanadium. Cupric oxide about 28% to 32%.

CONNELLITE. A hydrous sulpho-chlorate of copper, carrying 72.3% cupric oxide.

COPPER. Cu. Native copper. The chemical symbol Cu is an abbreviation of cuprum, the Latin word for copper. The metal, native or refined, has the following names in the modern languages: kupfer in German; kopfer in Swedish; kobber in Norwegian; cobre in Spanish and Portuguese; cuivre in French; rame in Italian.

Atomic weight, 63.6. Belongs in the first group and is the leader of the fifth series of Mendeleef's Periodic System. The group is as follows: 1. hydrogen; 2. lithium; 3. sodium; 4. potassium; 5. copper; 6. rubidium; 7. silver; 8. caesium; 9. unknown (possibly terbium, atomic weight 160); 10. gold; 11. unknown. The fifth series, of which copper is the basic leader, is as follows: 1, copper; 2, zinc; 3, gallium; 4, germanium; 5, arsenic; 6, se-

lenium; 7, bromine. The three metallic elements falling between series four and five in Mendeleef's table, are iron, cobalt and nickel. The frequency with which these three elements are found associated with copper, and the ease with which all four metals replace one another are notable. The general resemblance between copper, silver and gold, which form ascending steps in the same group, is readily apparent. Mendeleef's Periodic System may not prove the key to unlock the chemical secrets of nature, but it may be compared to a single tumbler in a combination lock, which has been nearly set in its proper position for opening.

System of crystallization. isometric. Tetrahexahedronal forms the most common, with much twinning. Crystals often show cavernous faces and occasionally elevations. Crystals are often distorted and pass gradually through distortions into filiform and arborescent forms. Druses, often of considerable size, in Lake Superior native copper mines, notably the Central and Phoenix mines in Keweenaw county, afford many curious crystallizations, filiform and arborescent. Native copper also occurs massive, and in granular form, and in laminae. In the Lake Superior mines the metal occurs in all observed forms and sizes; in lamellar form, from microscopic flakes up to sheets of immense size and weight; in crystals of greatly varying form and size; in grains from microscopic size to considerable nodules, and in the various filiform and arborescent shapes in druses. The finest particles are grains and exceedingly minute flakes occurring in an upper sandstone of the Keweenaw series, while the largest masses, weighing upwards of 500 tons, have been found in contact and fissure veins in Keweenaw and Ontonagon counties, though the bulk of the copper produced is secured from the stratified igneous and sedimentary beds of the Keweenaw series.

Cleavage: None. Fracture: Hackly. Tenacity: Second only to that of iron. Perfectly sectile. Highly ductile and malleable, ranking in these particulars with the precious metals. Electrical conductivity, 931, as compared with 1,000 for silver, which possesses the most perfect electrical conductivity of any known metal or alloy. Conductivity for heat, 898, as compared with 1,000 for gold, the most perfect conductor of heat.

Hardness: 2.5 to 3. Specific gravity, in vacuo, at 0 degrees Centigrade (equal to 32°, or freezing point Fahrenheit), when chemically pure and devoid of porosity, is 8.945. Specific gravity of ordinary copper of commerce, none of which is free from impurities, varies from about 8.75 when cast to about 8.95 when rolled, hammered or drawn, the exact gravity depending upon how handled and extent and nature of impurities present.

Luster: Metallic. Color: Copper-red. Streak: Copper-red, metallic, shining. Tarnishes upon exposure of air to brownish red, and is liable to form a coating of verdigris or oxide upon long exposure to air. Atmosphere laden with moisture and carbonic acid is especially favorable for the formation of verdigris.

Fusibility: Copper is fusible at approximately 2,000° Fahrenheit, or a

trifle less than 1,100° Centigrade. Color, when fused, sea-green. Copper becomes volatile under the high temperature of the electric arc.

Solubility: Copper is soluble in nitric acid, aqua regia, and strong boiling sulphuric acid, also, slowly, in dilute hydrochloric and sulphuric acids, with admission of air. When in solution in nitric acid will deposit metallic copper on iron immersed therein.

Affinities: Copper has a greater affinity for sulphur than for any other element. Also possesses marked affinities for arsenic, antimony, bismuth, oxygen and carbon dioxide, and unites with many other elements.

Alterations: Native copper alters on exposure, especially in damp air, to the simpler oxide and carbonate ores, such as cuprite, malachite and azurite, and occasionally, in time, to the more complex ore forms.

Occurrence: Native copper occurs, usually in small quantities, in most of the principal copper-ore producing districts of the world. The native metal is mined upon a considerable scale only in Bolivia and Lake Superior, U. S. A. The Lake Superior district is notable for producing copper from deposits of the native metal almost exclusively. The Lake Superior native copper carries considerable silver, but no gold. In districts outside of Lake Superior and Bolivia the metal occurs most frequently in connection with the oxide and carbonate ores, and occasionally with the more common sulphide ores.

Impurities: The native copper frequently contains silver, arsenic, bismuth, antimony, zinc, iron and mercury. Commercial copper, refined from ores, may contain any of the elements already named, and also gold, lead, selenium and tellurium, the latter two elements in very minute quantities.

COPPER GLANCE. Chalcocite.

COPPER NICKEL. Niccolite.

COPPER PITCHBLEND. A ferruginous chrysocolla.

COPPITE. A tetrahedrite carrying about 13% of iron.

CORNWALLITE. $5\text{CuO}, \text{As}_2\text{O}_3, 3\text{H}_2\text{O}$. Cupric oxide 58.2%.

COSALITE. A sulphide of lead and bismuth in which lead is frequently displaced by copper to the extent of 1% to 9% and silver 1% to 16%.

COVELLINE. Covellite.

COVELLITE. Cupric sulphide. CuS . Copper 66.4%. An alteration product from chalcocite and other sulphide copper ores.

CREDNERITE. $\text{Cu}_2\text{Mn}_2\text{O}_6$. Cupric oxide 43%, manganese sesquioxide 57%. Monoclinic; foliated crystalline. Cleavage: Basal, very perfect; less distinct in other directions. Hardness: 4.5. Gravity: 4.9 to 5.1. Luster: Metallic. Color: Iron black to steel gray. Streak: Brownish-black. Soluble in hydrochloric acid.

CROOKESITE. A selenide of copper, silver and thallium, $(\text{Cu}, \text{Tl}, \text{Ag})_2\text{Se}$, carrying 44% to 46.5% copper, 1.5% to 5% silver and 16% to 18.5% thallium.

CUBANITE. CuFe_2S_4 . Copper 23.3%, iron 41.3%, sulphur 35.3%. Also carries silica, and sometimes small percentages of lead and zinc.

CUPRIC OXIDE. CuO . Monoxide of copper. One atom of copper and one of oxygen, chemically united.

CUPRITE. Cu_2O . Copper 88.8%, oxygen 11.2%. Common names: Octahedral copper ore; red glassy copper ore; ruby copper. Isometric; commonly in octahedrons; also massive, granular; sometimes earthy. Cleavage: Interrupted. Fracture: Conchoidal. Brittle. Hardness: 3.5 to 4. Gravity: 5.85 to 6.15. Luster: Adamantine to earthy. Color: Light to dark red. Streak: Shining brownish red. Subtransparent to subtranslucent. Soluble in concentrated hydrochloric acid. Found in most copper districts, especially near surface.

CUPROBISMUTITE. Essentially $3\text{Cu}_2\text{S}$, $4\text{Bi}_2\text{S}_3$, in which silver sometimes partly replaces the copper. Carries 7% to 16% copper, with slight amounts of silver and iron, and occasionally lead.

CUPRODESCLOIZITE. A complex hydrous arseno-phospho-vanadate of lead, zinc, copper, iron and manganese. Cupric oxide from 6.75% to 11.21%.

CUPROPLUMBITE. A sulphide of lead and copper; probably $\text{Cu}_3\text{S}_2\text{PbS}$. Carries about 20% copper. From Chile.

CUPROSCHEELITE. A tungstate of copper and calcium, carrying silica. Has 3% to 7% cupric oxide.

CUPROTUNGSTITE. Tungstate of copper. CuWO_4 . Carries about 30% cupric oxide.

CUPROUS OXIDE. Cu_2O . Two atoms of copper chemically united with one atom of oxygen.

CYANOCHALCITE. A phosphoriferous chrysocolla.

CYANOCHROITE. $\text{CuSo}_4, \text{K}_2\text{So}_4 + 6\text{H}_2\text{O}$. Hydrous sulphate of copper and potash. Carries about 18% cupric oxide.

CYANOTRICHITE. Formula perhaps $4\text{CuO}, \text{Al}_2\text{O}_3, \text{So}_3 + \text{H}_2\text{O}$. A hydrous basic sulphate of copper and aluminum. Cupric oxide 47% to 50%.

DARWINITE. Whitneyite.

DELAFOSSITE. An oxide of iron, copper and aluminum, carrying about 47.5% monoxide of copper.

DEMIDOVITE. A phosphoriferous chrysocolla.

DIHYDRITE. $5\text{CuO}, \text{P}_2\text{O}_5 + 2\text{H}_2\text{O}$. Carries about 55% copper. Monoclinic; massive; fibrous. Cleavage: Imperfect. Fracture: Conchoidal to uneven. Brittle. Hardness: 4.5 to 5. Gravity: 4 to 4.4. Luster: Adamantine. Color: Dark emerald green. Streak: Pale emerald green. Translucent. Soluble in nitric acid. Occurrence: Germany and the Urals.

DIOPTASE. H_2CuSiO_3 or $(\text{CuO}, \text{SiO}_2, \text{H}_2\text{O})$. Cupric oxide 50.4%, silica 38.2%, water 11.4%. Common names: Emerald copper; emerald malachite. Rhombohedral; tetartohedral; also massive. Cleavage: Per-

fect. Fracture: Conchoidal to uneven. Brittle. Hardness: 5. Gravity: 3.28 to 3.35. Luster: Vitreous. Color: Emerald green. Streak: Green. Transparent to subtranslucent. Fusible with charcoal and soda. Gelatinizes with hydrochloric acid. Occurrence: Siberia, Hungary, Arizona, etc.

DOGNACSKAITE. A sulphide of bismuth and copper, carrying about 12% copper. From Hungary.

DOLEROPHANITE. A basic sulphate of copper, probably $2\text{CuO}, \text{SO}_3$, with 62.27% to 65.2% cupric oxide. A sublimation product from the laboratory of Vesuvius.

DOMEYKITE. Cu_3As . Common name: Arsenical copper. Carries 71.7% copper, 28.3% arsenic. Reniform and botryoidal; also massive. Fracture: Uneven. Hardness: 3 to 3.5. Gravity: 7.2 to 7.75. Luster: Metallic. Color: Tin white to steel gray, with iridescent tarnish. Occurrence: Lake Superior, Chile, Mexico and Saxony.

EHLITE. $5\text{CuO}, \text{P}_2\text{O}_5 + 3\text{H}_2\text{O}$. Carries about 53% copper. Closely related chemically and in physical characteristics to pseudomalachite and dihydrite.

EMERALD COPPER. Diopase.

EMPLECTITE. $\text{Cu}_3\text{S}, \text{Bi}_2\text{S}_3$. Carries bismuth 62%, copper 19%, sulphur 19%, with occasional silver, iron, lead, and silica, also traces of tellurium.

ENARGITE. Cu_3As_4 . Copper 48.3%, arsenic 19.1%, sulphur 32.6%. Orthorhombic. Small crystals, also massive; granular and columnar. Cleavage: Perfect to indistinct. Fracture: Uneven. Brittle. Hardness: 3. Gravity: 4.45. Luster: Metallic. Color and Streak: Grayish black to iron black. Opaque. Fuses on charcoal. Soluble in aqua regia. Occurrence: South America, Mexico, Luzon in the Phillipine Islands, also several American states.

EPIGENITE. Chemical formula uncertain. A sulpho-arsenide of copper and iron. Constituents by weight, about: Copper 41%, iron 15%, arsenic 12%, sulphur 32%. Orthorhombic. In short prisms, resembling arsenopyrite. Fracture: Uneven. Hardness: 3.5. Luster: Metallic. Color: Steel gray. Streak: Black. Soluble in nitric acid. Occurrence: Wittichen in Baden, Germany.

ERINITE. $5\text{CuO}, \text{As}_2\text{O}_3, 2\text{H}_2\text{O}$. Carries about 47.8% copper. Mammillated concentric crystalline groups; fibrous and rough. Brittle. Hardness: 4.5 to 5. Gravity: 4.04. Luster: Slightly resinous. Color: Emerald green. Streak: Grass green. Subtranslucent to opaque. Soluble in nitric acid. Occurrence: Cornwall and Utah.

ERUBESCITE. Bornite.

ERYTHROCALCITE. $\text{CuCl}_2 + 2\text{H}_2\text{O}$. Deliquesces on exposure. From crater of Vesuvius.

EUCAIRITE. A selenide of copper and silver. $\text{Cu}_2\text{Se}, \text{Ag}_2\text{Se}$. Copper 25.3%, silver 43.1%, selenium 31.6%.

EUCHROITE. A complex hydrous arsenate of copper, carrying 47.1% cupric oxide.

FAHLERZ. Tetrahedrite. Gray copper ore.

FAHLORE. Tetrahedrite.

FAMATINITE. Cu_3SbS_4 , arsenic occasionally replacing the antimony. Copper 43.3%, antimony 27.4%, sulphur 29.3%. Orthorhombic; isomorphous with enargite; also massive. Fracture: Uneven. Brittle. Hardness: 3.5. Gravity: 4.57. Gray with copper-red tinge. Streak: Black. Opaque. Fusible on charcoal. Decrepitates in closed tube. Occurrence: Cerro de Pasco, Peru.

FIELDITE. A stibio-arsenate of copper, having about 37% copper, 7% zinc, 1.2% iron and traces of gold and silver.

FOOTEITE. Formula probably $8\text{Cu}(\text{OH})_2, \text{CuCl}_2 + 4\text{H}_2\text{O}$. A hydrous chloride of copper.

FOURNETITE. Probably a mechanical admixture of galena and tetrahedrite.

FREDERICITE. A tennantite carrying about 6% iron, 3.4% tin, 2.9% silver and 3.4% lead.

FREIBERGITE. A tetrahedrite carrying 26% to 31% silver, as well as small quantities of iron and zinc.

FRIGIDITE. A tetrahedrite carrying about 8% nickel and 13% iron.

GERHARDTITE. A basic cupric nitrate. $4\text{CuO}, \text{N}_2\text{O}_5, 3\text{H}_2\text{O}$. Contains 66.2% cupric oxide, 22.5% nitrogen pentoxide, and 11.3% water.

GERMAN SILVER. An alloy of about 5 parts copper, 2 parts zinc and one part nickel.

GLASBACHITE. Zorgite.

GRUENAUITE. A supposedly impure polydymite (nickel sulphide) carrying 11.5% copper, also bismuth, iron, cobalt and lead.

GUEJARITE. $\text{Cu}_2\text{S}, 2\text{Sb}_2\text{S}_3$. Carries about 15.5% copper, 58.5% antimony and 25% sulphur. From Andalusia, Spain, found with siderite.

HENWOODITE. A phospho-arsenate of copper, with occasional aluminium and iron. About 7% cupric oxide.

HERMESITE. A tetrahedrite carrying mercury.

HERRENGRUNDITE. $\text{CaO}, 4\text{CuO}, 2\text{SO}_3 + 6\text{H}_2\text{O}$. Carries 50% to 54% cupric oxide.

HOMICHLINITE. Apparently a chalcopyrite partly altered to bornite. Carries about 44% copper and 26% iron.

HORSFORDITE. An antimonide of copper, probably Cu_3Sb . Carries about 73% copper, 27% antimony. Massive. Fracture: Uneven. Brittle. Hardness: 4 to 5. Gravity: 8.8. Luster: Metallic. Color: Silver white,

tarnishing easily. Opaque. Occurrence: In large deposits near Mitylene, Asia Minor.

HYDROCIANITE. Cupric sulphate. CuSO_4 . A rare sulphate from Vesuvius. Effloresces in the air.

INDIGO COPPER. Covellite.

JALPAITE. Probably $3\text{Ag}_2\text{S}$, Cu_2S , giving about 13% copper.

JOHANNITE. A hydrous sulphate of uranium and copper, of uncertain formula, carrying about 6% cupric oxide, and 67% to 68% uranic trioxide.

JULIANITE. A tetrahedrite-tennantite carrying less than 1% each of silver and iron, with about 52% of copper.

KEWEENAWITE. $(\text{CuNiCo})_2\text{As}$. Carries 39% to 54% copper, 9.7% to 20% nickel, 0.9% cobalt. An arsenide of copper, nickel and cobalt, of the mohawkite family. No crystals are known. Cleavage: Subconchoidal. Fracture: Uneven. Tenacity: Slight. Hardness: 4. Gravity: 7.7. Luster: Metallic. Opaque. Color: Pale red, tarnishing to darker red. Soluble in nitric acid. Occurrence: In the Mohawk mine, Keweenaw county, Michigan. Uses: Is smelted, in conjunction with mohawkite.

KLAPROTHOLITE. $3\text{Cu}_2\text{S}$, $2\text{Bi}_2\text{S}_3$. Carries 24% to 29% copper and 51.5% to 54% bismuth with 1% to 1.7% iron.

KROEHNKITE. CuSO_4 , NaSO_4 , $+2\text{H}_2\text{O}$. A hydrous sulphate of copper and sodium. Carries about 47% cupric oxide.

LANGITE. A basic sulphate of copper. 4CuO , SO_3 , $4\text{H}_2\text{O}$. Carries about 17% cupric oxide.

LAMPADITE. Cupreous manganese containing 4% to 18% cupric oxide.

LAVENDULAN. A hydrous arsenate of copper, cobalt and nickel. Constituents by weight: About 32% copper, 2.5% CoO , 1.35% NiO . Amorphous. Fracture: Conchoidal. Hardness: 2.5 to 3. Gravity: 3.01. Luster: Greasy to vitreous. Color: Lavender blue. Streak: Pale lavender blue. Translucent. Soluble in warm hydrochloric acid. Occurrence: Saxony and Chile.

LAXMANNITE. Phosphochromite.

LEPIDOPHARITE. A cupreous manganese oxide of fibrous and scaly form, from Thuringia.

LETT SOMITE. Cyanotrichite.

LEUCOCHALCITE. A hydrous arsenate of copper. In slender needle crystals. Color: Greenish white. Cupric oxide 47.2%.

LIBETHENITE. 4CuO , P_2O_5 , H_2O . Carries about 53% copper. Common name: Phosphate of copper. Orthorhombic. Fracture: Subconchoidal to uneven. Brittle. Hardness: 4. Gravity: 3.6 to 3.8. Luster: Resinous. Color and Streak: Olive green. Subtranslucent. Soluble in nitric acid. Occurrence: Hungary, Germany, Russia, Bolivia, Chile, Cornwall.

LIME-MALACHITE. A hydrous carbonate of copper with carbonate and sulphate of calcium.

LINARITE. A basic sulphate of copper and lead, PbO , CuO , SO_3 , H_2O . Contains about 17% to 20% cupric oxide.

LINDACKERITE. A complex hydrous sulpho-arsenate of copper, nickel and iron; cupric oxide 36.34%, nickel monoxide 16.15%.

LINNAEITE. A sulphide of cobalt in which cobalt is sometimes partially replaced by nickel, copper and iron, to extent of 1% to 42% nickel, 2% to 6% iron and 1% to 8% copper.

LIRCONITE. Octahedral arsenate of copper. Probably 18CuO , $4\text{Al}_2\text{O}_3$, $5\text{As}_2\text{O}_5 + 55\text{H}_2\text{O}$. Carries about 28.5% copper. Monoclinic; rarely granular. Cleavage: Subconchoidal. Imperfectly sectile. Hardness: 2 to 2.5. Gravity: 2.88 to 2.98. Luster: Vitreous. Color and Streak: Sky blue to verdigris green. Soluble in nitric acid. Occurrence: Cornwall and Hungary.

LUZONITE. Apparently a dimorphous form of enargite, found in the island of Luzon, P. I.

LYELLITE. An impure variety of langite, containing gypsum and iron.

MALACHITE. 2CuO , $\text{CO}_2 + 2\text{H}_2\text{O}$. Green carbonate of copper, the most common carbonate. Monoclinic; acicular or prisms. Commonly massive or frequently incrustive. Sometimes granular or earthy. Fracture: Subconchoidal, uneven. Brittle. Hardness: 3.5 to 4. Gravity: 3.9 to 4.03. Luster of crystals, adamantine to vitreous. Color: Bright green. Streak: Green. Opaque to translucent. Soluble in nitric acid. Occurrence: In most copper districts. Uses: An important ore of copper in certain districts.

MALINOWSKITE. A tetrahedrite carrying 13% to 16% lead, also silver and zinc in small percentages.

MARCYLITE. An alteration product of copper sulphide, consisting of hydrated oxides and sulphides of copper. Found in Arkansas, U. S. A., and Peru.

MATTRAMITE. A vanadate of lead and copper sometimes carrying also iron, zinc, manganese, magnesium and calcium oxides. From 19% to 21% cupric oxide.

MELACONITE. Tenorite.

MELANOCHALCITE. Form: Amorphous or cryptocrystalline. Color: Jet black, coffee brown powder. Luster: Vitreous. Hardness: 4. Specific gravity: 4.14. Opacity: The fine particles are translucent under high power of microscope, light passing through as yellow-brown. Chemical characters: Heated in a closed tube loses water and carbon dioxide and powder turns from coffee brown to brown black. With borax gives the sky blue color of copper. With salt of phosphorus gives a skeleton of silica in the blue glass. Is decomposed by hydrochloric acid, even a 3% solution of acid changing a fragment into a white silicious mass retaining the outlines of the original fragment, and only cupric chloride being produced. Composition: CuO , 76.88; SiO_2 , 7.80; CO_2 , 7.17; H_2O , 7.71; MO , .41; FeO , .07.

SiO_2 and CO_2 replace each other within certain limits. From this fact and the behavior of the mineral under dilute hydrochloric acid, it is deduced by Dr. Geo. A. Koenig, who identified the mineral, late in 1902, that there exists in it a compound orthoacid, $\text{H}_4(\text{Si,C})\text{O}_4$, with the hydrogen replaced by copper. Viewed in this light melanochalcite represents the basic copper salt of the ortho-silico-carbonic acid, the figures of the analysis agreeing closely with the formula $\text{Cu}_2(\text{Si,C})\text{O}_4 \cdot \text{Cu}(\text{HO})_2$. Occurrence: In the Calumet & Arizona mine, Bisbee, Arizona, the mineral always surrounding cuprite as a black band and being overlaid in turn by green copper silicate and copper carbonate.

MILANTERITE. $(\text{FeCu})\text{SO}_4 \cdot 7\text{H}_2\text{O}$. A sulphate of iron and copper, in which the latter has partly replaced the iron. Carries 10% to 16% cupric oxide.

MIXITE. A hydrous basic arsenate of copper and bismuth, of doubtful formula. Carries about 44% cupric oxide.

MOHAWKITE. $(\text{CuNiCo})_2\text{As}$. An arsenide of copper, nickel and cobalt. No natural crystals have been found, but artificial crystals, hexagonal, have been produced by synthesis by Dr. G. A. Koenig, the discoverer of mohawkite. Constituents by weight: Copper, 63% to 69%; nickel, 3% to 7%; cobalt, 0.5% to 2%; arsenic, about 28%, with more or less silver replacing copper. Cleavage: Indistinct. Fracture: Uneven. Tenacity: Slight. Hardness: 4. Gravity: 8.05. Color: Gray on fresh fractures, tarnishing to purple or brassy yellow. Streak: Gray. Opaque. Soluble in nitric acid. Occurrence: In a fissure vein, in considerable quantities, at the Mohawk mine, Keweenaw county, Michigan.

MOHAWK-WHITNEYITE. Cu_2As . Carries 83% to 87% copper. Is a mere name of convenience for an intimate blending of mohawkite and whitneyite, or keweenawite and whitneyite, rather than the name of a distinct mineral. Blending is indistinguishable to the eye, but is determined chemically. Malleable; only a little less so than copper. Cleavage: None. Fracture: Hackly. Hardness: About 5. Gravity: 8.6. Color: Gray, with yellow tinge, tarnishing to coffee brown. Streak: Gray. Opaque. Soluble in nitric acid with small residue of gray powder. Occurrence: At Mohawk mine, Keweenaw county, Michigan.

MOUNTAIN BLUE. Azurite.

MOUNTAIN GREEN. Malachite.

MYSORIN. An impure malachite from Mysore, India.

NAMAQUALITE. A hydrated oxide of copper, aluminum, manganese, calcium and silicon, with 44.75% cupric oxide. From Namaqualand, South Africa.

NANTOKITE. CuCl . A simple chloride of copper. Copper 84.1%, chlorine 35.9%. Isometric; granular; massive. Cleavage: Cubic. Fracture: Conchoidal. Hardness: 2 to 2.5. Gravity: 3.9. Luster: Adamantine. Colorless to grayish white. Transparent to translucent. Soluble in nitric or

hydrochloric acids and in ammonia. Gives off chlorine when struck a sharp blow. Oxydises readily on exposure to atmosphere. Occurrence: Carmen Bajo mine, Chile.

NOHLITE. A frightfully complex niobate of zirconium, uranium, yttrium, erbium, cerium, iron, calcium, manganese and copper; latter less than 1%. From a feldspar quarry in Nohl, Sweden.

OCTAHEDRAL COPPER ORE. Cuprite.

OLIVENITE. $4\text{CuO}, \text{As}_2\text{O}_3, \text{H}_2\text{O}$. Carries about 44.8% copper. Common name: Olive green copper ore. Orthorhombic; crystals prismatic, acicular; also globular and granular. Fracture: Conchoidal to uneven. Brittle. Hardness: 3. Gravity: 4.1 to 4.4. Luster: Adamantine to vitreous. Color: Olive green to blackish green. Subtransparent to opaque. Soluble in nitric acid.

ORILEYITE. Probably $(\text{Cu}, \text{Fe})_2(\text{As}, \text{Sb})_2$. A stibio-domeykite in which iron has partly replaced copper; found in Burmah.

PARAMELACONITE. Apparently a duplex oxide of copper, assaying about 85% cuprous oxide and 13% cupric oxide.

PEACOCK ORE. Bornite. Name sometimes applied to chalcopyrites showing iridescent tarnish.

PELOCONITE. A variety of cupreous manganese.

PENTLANDITE. A sulphide of iron and nickel, carrying varying amounts of copper in small percentages.

PERCYLITE. Chemical formula probably $\text{PbCuO}, \text{H}, \text{Cl}_2$. Copper about 17%. Hardness: 2.5. Color and Streak: Sky blue. Occurrence: South Africa, Mexico, Chile, Bolivia.

PHILLIPITE. Formula approximately $\text{CuSo}_4, \text{Fe}_2(\text{SO}_4)_2 + \text{O?H}_2\text{O}$. A hydrous sulphate of copper and iron.

PHILLIPSITE. Bornite.

PHOSPHOCHROMITE. A phospho-chromate of copper and lead, containing 4.57% to 7.36% cupric oxide.

PILLARITE. An aluminous chrysocolla.

PIRITAS FERROCOBRIZAS. Spanish for iron-copper sulphides.

PISANITE. $(\text{Fe}, \text{Cu})\text{SO}_4 + 7\text{H}_2\text{O}$. An iron sulphate in which part of the iron has been replaced by copper.

PLUMBOCUPRITE. Cuproplumbite.

PLUSH COPPER. Cuprite.

POLYBASITE. A sulphide of silver and antimony in which copper replaces part of the silver.

PRASINE. A varietal form of ehrlite, carrying arsenic, silica and alumina.

PSEUDOLIBETHENITE. A hydrous libethenite.

PSEUDOMALACHITE. $6\text{CuO}, \text{P}_2\text{O}_5 + 3\text{H}_2\text{O}$. Carries about 56.5% copper, 21.2% phosphorous pentoxide. Color: Dark emerald green. Greatly resembles dihydrite in chemical composition and characteristics.

PSITTACINITE. A phospho-arseno-vanadate of lead, copper, zinc and iron, with occasional cobalt. About 16% to 18% cupric oxide.

PURPLE COPPER ORE. Bornite.

RABDIONITE. A hydrated oxide of iron, manganese, aluminum, copper and cobalt, with about 14% of cupric oxide.

RED GLASSY COPPER ORE. Cuprite.

REDRUTHITE. Chalcocite.

REGNOLITE. $\text{Cu}_7\text{As}_2\text{S}_{11}$. About 33% copper, also silver, iron, zinc and trace of lead. Tetrahedral crystals. Associated with sandbergerite, which it greatly resembles. Occurrence: Cajamarca, Peru.

REZBANYITE. Cupriferous cosalite. A sulphide of lead and bismuth, carrying 1.5% to 4% cupric oxide, with some silver and a trace of zinc. Occurrence: Rezbanya, Hungary.

RIONITE. A varietal form of tennantite, carrying antimony, bismuth, iron, silver and cobalt.

RUBY-COPPER. Cuprite.

RICKARDITE. A telluride of copper. Cu_4Te_3 . Probably one molecule of cuprous telluride and two molecules of cupric telluride, $\text{Cu}_2\text{Te} \cdot 2\text{CuTe}$. Constituents by weight: Copper, 40.51%; tellurium, 59.49%. Massive. Fracture: Irregular. Hardness: About 3.5. Gravity: 7.54. Color: Brilliant purple, rivalling bornite tarnish, even on a fresh fracture, and showing deep color when pulverized. Fusible: On charcoal. Soluble: In nitric acid. Occurrence: Good Hope mine, Vulcan, Colo., in vein of pyrite carrying native sulphur and native tellurium, rickardite occurring as lense-shaped masses rather intimately associated with masses of native tellurium, latter being of unusual size, sometimes nearly 3 inches. Identified late in 1902 by W. E. Ford. Is the first telluride of copper discovered, and shows an interesting resemblance to the selenide of copper.

SANDBERGERITE. A tennantite-tetrahedrite carrying about 2.4% iron, 7% to 8% zinc and 3% lead.

SCHWARTZITE. A tetrahedrite carrying 15% to 17% mercury, with small percentages of iron and zinc.

SERPIERITE. A basic hydrous sulphate of zinc, chemical formula uncertain, carrying a small percentage of copper.

SIEGENITE. The nickeliferous variety of linnaeite, sometimes carrying small percentages of copper.

SMALTITE. Empirically CoAs_2 , but always found to carry iron, nickel and copper as well as cobalt. See chloanthite for further reference to diarsenides and arsenides of copper and associated metals.

SOMERVILLITE. $\text{CuSiO}_3 \cdot 4\text{H}_2\text{O}$. Same as chrysocolla except carrying double the water.

SPANGOLITE. A highly basic sulphate of aluminum and copper. $\text{Cu}_6\text{Al}_2\text{Si}_2\text{O}_{16} \cdot 9\text{H}_2\text{O}$. Carries about 59.5% cupric oxide.

SPANIOLITE. A tetrahedrite carrying mercury.

SPEISS. An alloy of copper with arsenic.

STANNITE. Perhaps $\text{Cu}_2\text{S}, \text{FeS}, \text{SnS}$, in which the iron is partly replaced by zinc. Carries about 29% copper, 25% tin and 23% to 29% sulphur, with iron 6% to 13.5% and zinc 1.7% to 9.7%.

STIBIODOMEYKITE. $(\text{Cu}, (\text{AsSb}))$. An antimonial domeykite. No natural crystals have been found; artificial crystals made by Dr. Koenig are hexagonal. Cleavage: None. Fracture: Irregular and uneven. Tenacity: Very slight. Brittle. Hardness: 4. Gravity: 8.1. Luster: Metallic. Color: Gray, with yellow tinge, like domeykite. Streak: Gray. Opaque. Soluble in nitric acid, with small residue of gray powder. Occurrence: At Mohawk mine, Keweenaw county, Michigan.

STROMEYERITE. Sulphide of silver and copper $(\text{Ag}, \text{Cu})_2\text{S}$, carrying about 52% silver and 31% to 34% copper.

STUEBELITE. A complex silici-hydrochlorate of aluminum, iron, manganese and copper, found on the island of Lipari, Italy. As determined, carries 15.25% cupric oxide.

STUDERITE. A varietal form of tetrahedrite carrying arsenic, iron, zinc, silver, lead and bismuth, in addition to the antimony, copper and sulphur found in the nominally perfect tetrahedrite.

STYLOTYPITE. $3(\text{Cu}, \text{Ag}, \text{Fe})\text{S}, \text{Sb}_2\text{S}_3$. Copper 28.3%, antimony 31.3%, silver 8.1%, iron 7.3%, sulphur 25%. Orthorhombic. Fracture: Imperfectly conchoidal. Brittle. Hardness: 3. Gravity: 4.8. Luster: Metallic. Color: Iron black. Streak: Black. Fusibility: Decrepitates and fuses readily on charcoal. Occurrence: Copiapo, Chile.

SUB-OXIDE OF COPPER. Cuprite.

SYCHNODYMITE. Essentially $(\text{CuNiCo})_2\text{S}_3$. A compound sulphide of copper, nickel and cobalt. Carries 17% to 19% copper, 35% to 36% cobalt and 3.5% to 6% nickel.

TAGILITE. $4\text{CuO}, \text{P}_2\text{O}_5 + 3\text{H}_2\text{O}$. Carries about 49% copper. Monoclinic; also spheroidal concretions with structure fibrous to earthy. Luster: Vitreous. Color: Verdigris to emerald green. Subtranslucent. Soluble in nitric acid. Occurrence: Russia and Chile.

TALLINGITE. $\text{Cu}_2(\text{OH})_2\text{Cl}_2 + 4\text{H}_2\text{O}$. Copper about 64%. A hydrated copper chloride. Sub-crystalline. Hardness: 3. Gravity: Approximately 3.5. Color: Greenish blue. Streak: White. Subtranslucent.

TENNANTITE. Gray copper ore. $\text{Cu}_3\text{As}_2\text{S}_7$. Copper 57.5%, arsenic 17%, sulphur 25%. The many varietal forms of this mineral are brought about by the replacement of copper with bismuth, lead, silver, zinc, iron.

mercury, nickel, cobalt, tin and platinum. Isometric; tetrahedral, also massive; granular, coarse or fine; compact. No cleavage. Fracture: Subconchoidal. Brittle. Hardness: 3.5 to 4.5. Gravity: 4.4 to 5.1. Luster: Metallic. Color and Streak: Flint gray to iron black. Opaque to subtranslucent in small splinters. Fusibility and Solubility: Same as tetrahedrite. Occurrence: At many points.

TENORITE. CuO . Cuprous oxide. Common names: Black copper; black oxide of copper. Copper 79.8%, oxygen 20.2%. Monoclinic; earthy; massive, pulverulent. Fracture: Conchoidal to uneven. Hardness: 3 to 4. Gravity: 5.8 to 6.25. Luster: Metallic. Color: Steel gray in flakes, dull grayish-black when massive. Soluble in nitric and hydrochloric acids. Occurrence: Italy, Tennessee, Lake Superior, etc.

TETRAHEDRITE. Gray copper ore. $\text{Cu}_2\text{Sb}_2\text{S}_7$. Greatly variable, shading into tennantite. Copper 52.1%, antimony 24.8%, sulphur 23.1%. This mineral is of protean form, frequently having a part of its copper replaced by iron, silver, mercury, zinc, lead, cobalt, nickel, tin and platinum. Isometric; tetrahedral; also massive; granular, coarse to fine; compact. No cleavage. Fracture: Subconchoidal to uneven. Brittle. Hardness: 3.5 to 4.5. Gravity: 4.4 to 5.1. Luster: Brilliant metallic. Color: Flint gray to iron black. Streak: Grayish brown to cherry red. Opaque in quantity: occasionally subtranslucent (cherry-red) in very thin splinters. Fusible on charcoal. Soluble in nitric acid. Occurrence: Cornwall, Germany, Peru, Chile, Bolivia, Arizona, Nevada, etc.

TILE ORE. A mixture of atacamite and cuprite with hematite and earthy material.

TORBERNITE. $\text{CuO}, 2\text{UO}_2, \text{P}_2\text{O}_5, 8\text{H}_2\text{O}$. Uranium mica. A hydrous phosphate of copper and uranium, frequently carrying arsenic. Carries 8% to 9% cupric oxide and 59% to 62% uranic oxide.

TRICHALCITE. $\text{Cu}_3\text{As}_2\text{O}_8 + 5\text{H}_2\text{O}$. Carries about 34% copper. In radiated groups, columnar; also in dendritic forms. Hardness: 2.5. Luster: Silky. Color: Verdigris green. Soluble in hydrochloric acid. Occurrence: Turginski mine, Russia.

TRIPPKEITE. An arsenite of copper. $?\text{CuO}, \text{As}_2\text{O}_3$. Found in druses.

TURQUOISE. A gem stone (hydrous phosphate of aluminum) colored by 2% to 8% cupric oxide.

TYROLITE. $5\text{CuO}, \text{As}_2\text{O}_3, 9\text{H}_2\text{O}$. Cupric oxide about 50%.

UMANGITE. A selenide of copper, formula Cu_2Se_3 . Carries 54% to 56% copper.

URANIUM MICA. Torbernite.

URANOCHALCITE. A hydrous sulphate of uranium and copper, formula undetermined, carrying about 6% to 7% cupric oxide.

VALLERITE. A mineral containing copper, sulphur, iron, alumina, magnesia and water. Color resembles pyrrhotite. Very soft. Occurrence: At Nya Kopparberg, Sweden.

VARIEGATED COPPER ORE. Bornite.

VAUQUELINITE. Phosphochromite.

VELVET COPPER ORE. Cyanotrichite.

VENERITE. A hydrous silicate of aluminum, iron (both protoxide and sesquioxide), magnesium and copper. As determined carries about 15.25% cupric oxide.

VERDIGRIS. Copper carbonate. Formed from the metal by carbon dioxide assisted by moisture in the air.

VESZELYITE. A hydrous phospho-arsenate of copper and zinc. Percentage of cupric oxide about 37.4%.

VOLBORTHITE. A hydrous vanadate of copper, barium and calcium. Cupric oxide about 38.4%.

WARRINGTONITE. A varietal form of brochantite.

WHITNEYITE. Cu_3As . About 85% copper. Massive; crystalline; granular. Malleable. Hardness: 3.5. Gravity: 8.4 to 8.6. Luster: Sub-metallic. Color: Grayish white, tarnishing to bronze or brownish black. Slightly iridescent. Opaque. Soluble in nitric acid. Occurrence: Houghton county, Lake Superior, Sonora, Mexico, and Chile.

WINKLERITE. A highly complex hydrated carbo-oxy-arsenate of copper, cobalt, nickel and calcium, from Almeria, Spain; carrying about 15% in cupric oxide.

WOOD COPPER. Olivenite.

WITTICHENITE. Cu_3BiS_4 . Copper 38.4%, bismuth 42.1%, sulphur 19.5%. Orthorhombic, massive and disseminated, also coarse columnar. Fracture: Conchoidal. Hardness: 3.5. Gravity: 5. Color: Steel gray to tin-white, tarnishing to pale lead gray. Streak: Black. Decomposes easily on charcoal. Soluble in nitric or hydrochloric acids. Occurrence: At Wittichen, Baden, Germany.

WOLFSBERGITE. Chalcostibite.

WOODWARDITE. A complex sulphate of copper and aluminum, carrying 47% to 49% cupric oxide and 13% to 19% aluminum sesquioxide.

YPOLEIME. $5\text{CuO}, 2\text{P}_2\text{O}_5 + 5\text{H}_2\text{O}$. A hydrous phosphate of copper of the pseudomalachite series.

ZEUNERITE. An arsenate of copper and uranium corresponding to the phosphate torbernite. Carries about 7.5% cupric oxide.

ZINKAZURITE. A mineral from the Sierra Almagrera, Spain. Essentially a hydrous sulphocarbonate of zinc and copper.

ZINKENITE. A sulphide of lead and antimony in which copper or silver sometimes replaces lead to a trifling extent.

ZIPPEITE. A hydrous sulphate of uranium and copper, carrying about 5% cupric oxide.

ZORGITE. A selenide of copper and lead, formula variable, giving 4% to 15.5% copper and 41% to 60% lead, with traces of silver, iron and mercury.

CHAPTER IV.

METALLURGY OF COPPER.

Upon this topic many volumes have been written, all of more or less value, some few dealing with the entire subject, while the majority treat of a portion only. It is manifestly impossible to thoroughly cover the entire metallurgy of copper in the limits of a single chapter, yet I have attempted, conscientiously, to review the subject, briefly but fairly, giving to each topic its just proportion of attention, and to set forth in this chapter a very short but connected and logical account of the principal features of the various processes of copper reduction. To those desirous of going deeply into the matter I can but advise careful perusal of the works of Peters, Eissler, Douglas, and others who have written exhaustively of the various branches of the reduction and smelting of copper.

The metallurgy of copper is divisible into three principal groups, these being pyro-metallurgy, hydro-metallurgy and electro-metallurgy—the three kingdoms of fire, water and electricity. All are more or less closely related and interdependent. Copper secured by the various wet processes must be refined by fire or electrolysis, or possibly both. The production of commercial copper by heat alone is possible, and fire is the sole element used in the purification of the native copper of the Lake Superior district. Electrolysis refining is in general use for refining crude coppers containing high values in gold and silver, and for freeing the metal from more deleterious elements.

A brief glance at the history of copper production may not be out of place. The smelting of copper must have begun at an early date, as copper and bronze have been found in tombs and disinterred cities of very great age. The copper must have been smelted, because the ancients possessed no mines of the native metal. The process of smelting was never lost and was handed down from generation to generation, from Egyptian through Roman to modern times. One of the Swansea smelters dates back from the Sixteenth century and was preceded by others of which there is little or no record. The Welsh and English were the first to engage in copper smelting as an independent industry, the practice from time immemorial having been to smelt the ore at or near the mines. As a result of the establishment of independent works that bought ore from many mines, the Welsh smelters progressed more rapidly in metallurgical knowledge than their competitors and gained great skill in handling refractory ores. As a consequence Swansea became the seat of the greatest diversified smelting

industry on the globe, and the location of the city being favorable for the receipt of ore and matte consigned from foreign countries, the industry has flourished for several centuries, but of late years has declined in importance, owing partly to the tendency toward refining ores as near as possible to the mines, which is but a recurrence to the ancient practice. The decadence of the Welsh smelting industry has also been aided, beyond doubt, by the arbitrary restrictions placed on shippers until very recently.

The Swansea smelters at the height of their prosperity drove hard bargains with producers. For a ton, 21 hundredweights were demanded, and received. An allowance of $3\frac{1}{2}$ pounds on 3 hundredweights was exacted for "draftage." Allowances were also claimed for moisture. No new smelters have been built at Swansea since 1867, though perhaps 75 per cent. of the world's copper output was smelted there at a period about the middle of the Nineteenth century. The Welsh port still continues as the most important independent smelting point of the world, but, for the reason that the reduction of ores can now be accomplished more cheaply near the mines in most cases, can never regain its lost prestige in the copper trade.

The first smelters in the United States were probably primitive affairs, of small capacity, built late in the Eighteenth century, but the first American smelter of which there is an authentic record was blown in at Taineston, Maine, in 1836. The first successful American smelter was built at Baltimore in 1845, and became the nucleus of what is now one of the most important metallurgical plants of the United States. A year or two later a small smelter was built at New Haven, and from this primitive plant dates the great copper and brass manufacturing industry of the Naugatuck Valley of Connecticut. At about the same period a smelter was erected at Bergen Point, New Jersey, the precursor of the present vast works at Perth Amboy and other points on the Jersey shore. A smelter was erected at Pittsburg in 1848, and about 1850, smelting plants were built at Cleveland, Detroit, and Hancock. Smelters were built at Ducktown, Tennessee, in 1854, and since that time the process of the copper smelting industry in the United States has been steady.

In Europe there were copper smelters at very early periods in Germany, Sweden, Austria and elsewhere. At the beginning of the Eighteenth century in addition to an already extensive copper industry in Wales, there were smelters at two points in Cornwall, also in Yorkshire, Lancashire and Staffordshire, the last named works remaining in operation until 1890. There were also smelters near the principal mining centers of Germany, Austria, Hungary, Sweden, Norway, Italy, France and Russia, while in Japan and China primitive smelting operations were carried on at a number of points, and it is certain, though lacking detailed accounts, that copper was being mined and smelted, in a small way, in India, Persia, and other partially civilized countries. Copper was also secured to some small extent from the refining of the cupriferous silver ores of Bolivia, Chile and Mexico.

With the opening of many new mines during the fourth and fifth dec-

ades of the Nineteenth century, when Lake Superior, Chile, South Africa and Australia became prominent as producers; smelters; usually of crude pattern, were built at and near the mines, in many of the newer districts. The smelting of copper has now become a world-wide industry, and few of the leading copper producing countries are without large and well-managed works. The margin of profit is now so small, and the cost of transportation so great, that the larger producers are forced to produce at least the cruder forms of copper, ranging from matte to blister copper, at the mines, or near them.

Before treating of the various smelting processes, reference may be made to the impurities found in copper, with which the smelter must contend in his efforts to secure a product of good commercial quality. These impurities vary greatly in number and extent, in the ores of various districts.

Bismuth is the worst enemy of copper, and its most insidious foe. It is eliminated with difficulty, and one-fiftieth of one per cent. will cause red-shortness, while one-twentieth of one per cent. will cause cold-shortness. Bismuthiferous ores of copper are rarely smelted, except when carrying large quantities of silver, but bismuth is frequently found in ores where it apparently has no business appearing.

Arsenic, like iron, is found in nearly all brands of commercial copper. It slightly diminishes electrical conductivity, but under one per cent. does not seem to affect ductility.

Lead, next to bismuth and arsenic, is the worst impurity in copper. One-half of one per cent. will make the metal cold-short, and one per cent. will ruin copper for all purposes except casting, for which use the lead is a positive advantage, as it prevents the porosity so frequently found in cast copper.

Antimony, like iron and arsenic, exists in most commercial copper, but is usually found in small percentages. It lowers electrical conductivity, but under one-half per cent. does not seem to affect ductility.

Sulphur, frequently found in excess in poorly refined copper, reduces conductivity and ductility when present to the extent of one-fourth per cent., and one-half per cent. causes cold-shortness.

Zinc forms an alloy with copper, and in considerable quantities lessens ductility, but does not greatly affect electrical conductivity. Zinc is greatly disliked by copper smelters, and a penalty is charged for smelting ores high in this element. Many otherwise promising copper deposits are unworked because of the excess of zinc, which is eliminated with difficulty. In this connection attention is directed to the successful work being done at the Pride of the West mine, in Arizona, where copper and zinc ores are secured separately by successive concentrations.

Tin, in small quantities, does no particular damage, but materially lessens ductility when present to the extent of one per cent. or more.

Iron is found in practically all copper, except that which is chemically pure, in quantities ranging from a trace up to appreciable percentages. It

seems to form an alloy with the copper, and while reducing conductivity does not injure the copper otherwise, unless existing in unusual quantities.

Nickel, in small percentages, is a common impurity. It has apparently about the same effect as iron, to which it is related, and beyond a slight reduction in conductivity has no apparent bad effect.

Silicon, even in fractional percentages, causes a marked decrease in electrical conductivity, but up to 2 per cent. does not affect ductility. Three per cent. causes brittleness, and above 5 per cent. the metal is rendered too brittle for any ordinary use.

Phosphorus, in the minute quantities usually found in copper, has no particularly bad effect, but one-half of one per cent. will cause red-shortness.

Tellurium, even in minute quantities, produces red-shortness and cold-shortness, though not greatly affecting conductivity or ductility.

Carbon, in the form of carbon dioxide, may be absorbed by copper at a critical pitch of the metal, and produces porosity, though apparently having no other effect. This, or other gases, absorbed by the copper when in a molten state, are let out as the metal sets, thus producing a more or less porous structure.

A peculiar feature of cuprous oxide is that it will melt, at red heat, without decomposition, and frequently becomes a component of the refined metal. Cupric oxide, in small quantities, has no apparent effect on the metal, but in quantities of one-half per cent. or more lowers ductility, though not injuring the metal in other respects, even if present in quantities up to ten per cent.

In the various processes of smelting, a variety of semi-metallic compounds are formed before the metal itself is produced. The first product of fusion is known as matte, or regulus. It is difficult to define copper matte, because it may contain greatly varying proportions of any of its elements, and a considerable variety of elements, of which copper and sulphur are necessary, while iron, arsenic, and a long list of impurities, valuable and damaging, are found in greater or less number and percentages in various mattes. Matte may contain as little as 15 per cent. of copper, or as much as 70 per cent., though usually ranging from 25 or 30 per cent. in the lower grades up to 50 or 55 per cent. in the higher. The tendency of modern practice is away from the old plan of blowing up the matte to blister copper by easy stages. In the most modern plants the matte is blown up to blister copper in two or three fusions from the calcined ore. Copper matte is variously considered as an alloy, a chemical compound, or a mechanical mixture. It is obviously a semi-metallic product, possessing certain of the characteristics of metal, such as malleability, which is quite marked in the case of some high-grade mattes.

Blue metal is a high-grade matte, carrying 60 to 65 per cent. copper. White metal is a matte running 70 to 75 per cent. copper, and pimple metal carries 80 to 85 per cent. copper. Black copper is impure metallic copper carrying 1 to 5 per cent. sulphur, besides sundry metals and metalloids

as impurities. The name comes from the oxidization of the surface to a dull black. Blister copper is the highest grade of unrefined metal, carrying 96 to 99.5 per cent. copper, with one per cent. or less of sulphur, besides varying impurities. Its name comes from the blebs or vesicles in which the bubbles of gas from sulphur and other volatile elements are retained, as the copper hardens. Blister copper looks well, and is suitable for many uses, but is nearly always red-short, though not cold-short. It naturally varies considerably, the purer grades being practically a good quality commercial copper.

Cement copper is a reddish precipitate, composed of metallic copper and sundry impurities, requiring reduction and refining before use, being usually brought to blister copper, then refined. Copper bottoms are alloys of metallic copper and metals existing in the matte as impurities, formed in matting. Their formation leaves the matte purer, and the bottoms are resmelted and refined.

Finished copper is put out under many different names and brands. The principal English brands are "best selected," for brass foundries; "tough copper," for wire and sheets, and "tile," which is brittle, and suited for castings only. "G. M. B." means "good merchantable brands," and is sometimes stretched and sometimes contracted in meaning, according to whether buyers or sellers hold the whip-hand. "Chile bars," are bars of blister copper from Chilean smelters, ranging from 95 to 99 per cent. pure, and are refined before use. The principal American grades are "Lake," a very tough and ductile copper from the Lake Superior native copper mines; "electrolytic," produced by electrolysis from blister copper; "standard," which means almost anything that is neither very good nor very bad, and "casting," which, as its name implies, is suitable for castings only. The metal is turned out in a variety of forms, as ingots, molds, cakes, wire-bars, anode bars, etc., according to the particular use for which the copper is destined.

As most copper ores occur disseminated through gangue-rock, the first process of conversion into metal is one of concentration. By crushing the disseminated ore and worthless gangue, the ore, by reason of its greater specific gravity, can be separated from the gangue to a considerable extent. There are many variations, according to local conditions, but in the main the process of concentration is identical. The heavy ore is first reduced to smaller size, then concentrated by gravity, with the aid of water and jigging. Hand-picking is sometimes resorted to, and there is a dry process concentrator, in which air is used instead of water, this being suitable for districts where water is scarce and expensive. The first crushing is usually done with jaw-crushers. Gyratory crushers are sometimes used, and give good work, copper ores not being so liable to sliming as softer ores, such as galena. The next process of reduction is usually to pass the crushed ore through trains of Cornish rolls, for further reduction. Occasionally smaller jaw crushers are used, and sometimes rolls are used exclusively for crushing.

After reduction to desired size the ore is passed over jigs. These are of many patterns, but the essential principals are the same in all, the lighter gangue being driven off by a combination of movement in the jig and the force of running water, the vibration and water jets being so regulated as to permit the ore to remain while worthless rock is washed away. No matter how carefully this work is done, a little ore is lost, and a little rock remains with the concentrated ore. In modern mills the "fines," or very small particles of crushed rock and ore, are passed over patent concentrating tables, or the old style round-tables, for the saving of the very minute particles.

In the Lake Superior district, where copper is found native, the processes of concentration and smelting differ slightly from those used elsewhere. The metal sometimes occurs as masses weighing from a few pounds up to hundreds of tons. The larger masses are cut underground, with long-handled chisels, to sizes that can be hoisted, and when on the surface are hand-cobbed to separate as much as possible of the adhering gangue, then put directly into the furnaces for smelting. The smaller masses are cobbed under steam-hammers, and also sent direct to the smelter. The bulk of the ore occurs as disseminated particles of small size, scattered through amygdaloid or conglomerate rock, in quantities from one-half of one per cent. to 10 per cent. This rock is hoisted to the surface as broken, put through one or two crushers in a rock-house which is part of the shaft-house, sorted by passing over grizzlies, then dumped direct into hopper cars and carried to the mill. Ore from the cars is dumped into bins at the top of the mill, thence fed by gravity under the stamps, which are very powerful, and actuated by steam, the feed being regulated by an experienced workman in charge. Such stamps, of the most modern design, crush 400 to 550 tons each, per working day of 20 hours, the rock being exceedingly refractory. From the stamps the crushed rock is fed to jigs, a portion of heavy copper being secured direct from the mortar boxes. The jigs are in series, taking coarse and fine sands from the stamps. A portion of the coarse sands discharged as tailings are recrushed and rejigged. The fines, or slimes, are passed over slime-tables of various patterns, those in principal use being the old-style Evans round-table, sometimes with two or three decks to save floor space, and the Wilfley and Overstrom patent tables, whereon concentration of fine metallic particles is effected by a combination of oscillatory motion, water jets, and parallel ridges on the bed of the table. The waste sands are washed away by strong currents of water, and piled some distance from the mill, while the concentrated metal with its adhering gangue-rock called "mineral," is taken to the smelters for reduction. The former practice of dressing this mineral to a high percentage of metallic contents is giving way to an opposite course, all of the Lake mills now dressing their mineral to much lower grades than formerly, it having been found that the cost of smelting mineral, which is about \$5 to \$7 per ton, renders it more profitable to fuse the extra gangue-rock than to lose the large amount of fine copper

formerly going away in the slime sands. The mineral produced by the Lake mills now ranges from 50 to 85 per cent. metallic copper. Many of the big mills make several different grades of mineral, varying in richness as well as in size of the nodules of metal. There is more or less hand-picking of the coarser grades of mineral for particles of silver, and a small percentage of the refined copper turned out is treated electrolytically, to save the silver that would otherwise be lost. The Lake copper carries no gold.

The smelting of Lake copper is done in blast furnaces, often of considerable size. The crude mineral is charged in the furnaces with fuel, usually anthracite coal, though coke is used at a pinch, and limestone for flux. The product of the first fusion comes as impure copper and cupreous slags, the latter being resmelted. The crude copper is refined by a successive smelting. The refined copper always contains more or less silver, with traces of iron, arsenic, etc. Commercial brands of Lake copper are always less pure, chemically than high-grade electrolytic copper, but the Lake product possesses superior ductility and is especially desirable for wire-drawing and similar uses.

The great bulk of the world's copper supply comes from sulphide ores. While leaching processes are employed at many mines, the greater part of the sulphide ores is reduced by heat alone, and in such cases it is desirable that as much as possible of the sulphur be eliminated before the ore goes to the smelter, unless the system of pyritic smelting be employed. To accomplish the partial oxidation of the sulphur in sulphide ores, such ores are given a preliminary roasting or calcination. This may be accomplished by heap-roasting in open air, or by roasting in stall, shaft or kiln furnaces. Heap-roasting on a large scale causes the destruction of vegetation for several miles away, because of the fumes of sulphurous and sulphuric acid driven off.

The processes of heap-roasting, while identical in the main, differ greatly in almost every detail of practice. It is perhaps applied most successfully at the Rio Tinto mine, where the heaps are of enormous size, and are burned with a marvelously small amount of carbonaceous fuel. At this mine hand-selected rich ores, averaging 8 to 10 per cent. copper, are piled in heaps of about 400 tons, and fired with a single cord of wood, such heaps burning 6 to 9 months each. The time ordinarily required for roasting an average heap is 30 to 90 days, 60 days being perhaps a fair average. The ground for a roast-heap cannot be prepared with too much care. Allowance should be made for sufficient slope to provide good drainage, and ditches should be dug to carry off rain water, and also to divert the drainage of adjacent ground, as a large proportion of the metallic values may be leached out by water in a short time. The ground is usually surfaced with broken rock or slag, and given a final top-dressing of clay, well rolled or pounded. Above this should be placed a layer of fines, three to six inches deep, to prevent baking of clay and its inclusion with the roasted ores, when the latter are removed. On this surface of fines the roast-heap proper is built. There

is a first layer of wood, much or little according to the nature of the ores, and usually more than is really needed. The worst wood available will do very well, if care is taken to furnish a little good wood for kindling the fire-channels are provided, so that after the wood has burned out there is draught through the heap. Chimneys of boards are built at various points, the number of channels and chimneys depending on the size of the heap. In American practice a cord of wood is used for an average of 30 to 50 tons of ore, the percentage of fuel growing less as the size of the heap is increased. The first layer of ore is of coarse lumps, 2 to 6 inches in size, or even larger, surmounted by a layer of "ragging," or medium-sized lumps, and topped with a layer of fines. The greater the percentage of sulphur, the lower the height of the pile. The shape of the heap on the ground may be square or oblong, usually the latter, to facilitate upbuilding and removal. In a roast yard it is necessary to have a considerable number of heaps, so that the process may be continuous. The heap is fired, after building, and the wood gradually kindles the sulphur in the ore which continues to burn for many weeks. The success or failure of the process depends mainly upon careful handling, the heap requiring a small but steady supply of air, for even roasting. Too much air allowed to enter the heap will result in matting part of the ore. Heap-roasting requires a great deal of hand-labor, and has various objectionable features, which restrict its use.

Ores are also roasted in kilns and in stall and shaft furnaces. A stall furnace is merely a perfected form of heap-roasting, wherein brick, stone or slag-block walls are built about the roast-heaps, regulating the air currents. At times a cover is built above, thus preventing the access of rain-water, which would quickly leach out a large part of the copper values. In the most modern forms of stalls, paved or grated floors are added, and stalls grade into furnaces by the addition of flues and chimneys for the carrying off of the roast-gases.

The fumes of sulphur from roast-heaps are very objectionable, and also wasteful. Such fumes can be kept from the air and utilized in the making of sulphuric acid, by passing through lead-lined acid chambers, in which the acid fumes are taken into solution by water. Shaft-furnaces are especially used where the fumes are saved for the manufacture of acid. The Gerstenhoefer is perhaps the best-known form of shaft furnace. This consists of a vertical shaft with a mechanical device for feeding the charge from above, and the fresh, pulverized ore, is intercepted in its downward progress by projecting ledges, thus permitting its partial oxidation. Kiln-roasting is also employed where sulphurous fumes are saved for acid making, the kilns being of shaft-like form. This process has the advantage of permitting a much more complete desulphurization than is possible in heap or stall-roasting. Matte is sometimes heap-roasted, requiring several successive burnings. The practice is of doubtful utility, unless in exceptional cases.

The roasting of sulphide copper ores may be reducing or merely oxidiz-

ing in nature. The calcination of copper ores is an apparently simple process but in practice requires nice discrimination and great care to secure the best results, owing to the varying proportions of copper, sulphur, iron and other elements found in the raw ores. The skill and care with which the calcining is done greatly affect the costs and success of the future processes of reduction. As the combinations of ores and requirements are almost innumerable, the practice in one district is usually more or less different from that of another, and even mines in the same district do not always perform their calcining in a precisely similar manner. Securing the best possible results in each case calls for individual treatment by a metallurgist skilled in practice as well as in theory—and more especially one skilled in practice.

Calcining may be performed in hand furnaces, but automatic devices are more economical, and are in general use in all but the smallest and least modern works. Hand reverberatory furnaces with a hearth heated by a fireplace separated from the furnace by a bridge-wall with side openings, give as good satisfaction as can be secured with hand furnaces. Muffle furnaces are sometimes used. These give a very equable heat, but are expensive in operation and not generally used. There are various forms of cylinder calciners, among the best of which is the Douglas muffle cylinder calciner, with continuous discharge. This has a central flue of tile, which takes combustion products direct to the chimney. This is suited for general work, but is especially adapted for the economical and cleanly saving of sulphurous fumes for the making of acid. Hand-power cylinders are occasionally found in use, but are as expensive and wasteful as hand-power apparatus of any sort, where mechanical means can be found for doing the work. The Brueckner automatic intermittent discharge cylinder has a greater diameter and shorter length than other varieties of cylinders, and is in more general use than the other varieties, as it takes less floor space and is automatic and efficient in operation.

The principal form of calciner is the automatic reverberatory, of which there are a number of patented varieties, all of more or less value. These consist essentially of stationary reverberatory furnaces, through which plows are dragged to rabble the calcining and remove the calcined ore. One of the best forms is the turret furnace, in which horizontal revolving plows are actuated from a central shaft, while the ore charge is fed automatically from hoppers above. The turret furnace is economical of floor space and attendance, and may be built double or triple decked, if desired. In calcining ores a certain amount of copper is volatilized, and carried off with the roast gases, but in all modern plants such copper is saved in dust chambers, where it is deposited and whence it is afterward removed and smelted. As flue dust is usually high in arsenic and antimony, volatile elements that are highly deleterious to finished copper, flue dust is commonly smelted by itself, though sometimes mixed with matte.

The fuels used in smelting copper are of considerable variety, and depend

somewhat upon availability and price, as well as local requirements. Anthracite and bituminous coal, coke and charcoal are used. Coke is in most general use, while charcoal is usually obtainable at more remote points only. Anthracite coal is a very good fuel for most purposes, but unobtainable at reasonable prices in the majority of districts, while bituminous coal is the most objectionable fuel, and, next to charcoal, the least used, though there is such a great difference in the nature of soft coal that some varieties work well in partial or complete fuel charges, while others give most abominable results. Gas is also used at a few points, and seems suited for reverberatory furnace work. There seems no good reason why petroleum, properly sprayed, should not serve the same purpose. The nature of a charge placed in a furnace necessarily depends, first, upon the available ores, and secondly, upon the nature of the principal ores requiring smelting. In practice it is desirable to blend various copper ores, where the necessary grades can be secured, rather than to add barren fluxes, but this is, of course, a matter depending upon the availability of the ores desired. One of the secrets of the success of the big custom smelters is found in their ability to mix various ores from different districts so as to lessen or entirely eliminate the use of barren limestone or iron ore for fluxing. The use of "sweeteners" is to be commended, where such ores are obtainable at reasonable prices. Ferruginous ores are required for mixture with silicious ores. Local conditions regulate practice, and the soundest theories must often step aside in the presence of prohibitory freight rates; and high freight rates are common in many of the greatest copper producing districts of the world.

Furnaces for the smelting of copper ore are of two classes, the blast furnace, which has a powerfully reducing atmosphere, and the reverberatory furnace, where a reflected flame gives a neutral atmosphere. The blast furnace is a device so ancient that the date of its invention is unknown. In its crudest form it is but an oven in which ore and fuel are placed together and air pumped in to aid in reduction. The modern improvements on the blast furnace have been in the direction of enlarged capacity and details, the central plan remaining the same as a thousand years ago. There were blast furnaces for the reduction of copper ores in existence in very early days at Eisleben, Germany; at Roros, Norway; in Atvidaberg, Sweden; at Perm, Russia, and in other parts of Europe. The development of the blast furnace to the present day size and efficiency has been accomplished by a steady succession of little improvements, covering many centuries, rather than by single strides, yet it may be said that blast furnace smelting has been improved more in the past thirty years than in the preceding five centuries.

The smelting of copper ore in a blast furnace is the process of reducing the metal from its ores or gangues by the use of carbonaceous fuel, usually coke, in an oven having a blast of air, which may be drawn direct from the atmosphere, or heated before passing through the tuyeres. This process is adapted to the reduction of practically all of the copper ores. In addition

to the charge of ore, fuel and fluxing elements are added, the flux being cupriferous or barren, as circumstances may dictate. One of the greatest improvements of modern days in blast furnace practice has been the invention of the water-jacket. This was devised at the Longfellow mine, Arizona, in 1874. The smelter was 800 miles from a railroad, fire-brick cost one dollar each, and were of short life, the ore being highly basic. As it was manifestly impossible to make enough copper to pay for the furnace linings, the experiment was tried of using iron sides for the furnace, with hollow walls, through which water was circulated. This proved a success, and is now in very general use, water-jacketed cupolas being far more common at present than those with fire-brick linings. Despite the considerable loss of heat resulting from the circulation of water between the inner and outer shells, the water-jacketed cupola has proved itself both efficient and economical. Such furnaces are now built with daily capacities of 200 to 300 tons. The shells are usually circular or oval, with jackets of cast-iron, wrought-iron or soft steel, and copper is frequently used.

Reverberatory furnaces are a Welch invention, dating only from the last quarter of the Nineteenth century, and after running the gauntlet of conservatism have so effectually proven their value that their utility is no longer questioned. Reverberatory furnaces are adapted to all classes of ore, but are more especially suited for the reduction of sulphides, for which purpose they unquestionably lead the old-style blast-furnace. In the reverberatory furnace the flames from a lower grate, on which the fuel is fired, are reflected back upon the ore charge, lying on a bed above, thus giving a neutral atmosphere. The fore-hearth is brick-lined and movable, and the air entering the furnace is frequently preheated. In the best practice five to seven tons of ore are smelted per ton of fuel consumed, the larger furnaces giving the higher duty. Furnaces of this pattern having a daily capacity of 250 tons are not uncommon, and even larger have been built and operated successfully. In the case of sulphide ores it seems certain that reverberatory furnaces produce a richer matte from similar charges than do blast furnaces.

In the case of oxide and carbonate ores, the smelting is done in the same manner as previously described in the treatment of the native copper of Lake Superior. With the sulphide ores the process differs. The raw ore is roasted, or more frequently calcined, before charging in the furnaces, commonly of the reverberatory type. Under the influence of the reverberatory blast chemical reactions are set up that lead to the volatilization of a considerable portion of the sulphur, also part of the other volatile elements, such as arsenic, etc. The product of the first fusion is secured as a low-grade matte. If the charge is blown up to more than 50 per cent. at the first smelting the slags will probably show too much copper, entailing direct losses or resmelting. The old practice was to bring the low-grade matte from the first fusion up to blister copper by successive smeltings, in easy stages, but the modern practice is to bring the matte to high grade by as

few fusings as possible, and the former heavy losses in slags have been minimized by close attention to details.

The "direct method" of copper refining consists essentially of the fusion of a mixture of raw and calcined matte of about white metal grade, the resultant product being blister copper.

The "reactor process," for which much is claimed, and from which much is hoped, is a patented system for the production of blister copper from mattes of all grades by a single fusion. The essential features of the process are the mixture of superheated steam and fine sand with atmospheric air, which mixture is drawn into the furnace through two or more sets of tuyeres, striking the surface of the molten charge and setting up a circular motion therein, which keeps the matte free from slag, and exerts both an oxidizing and a scorifying process simultaneously. It is claimed that gold values present in the charge will be precipitated in the first matte, and that matte ranging in tenor as low as 15 per cent. can be brought up to blister copper at a single fusion, in a very short time, and that the blister copper so obtained will range above 99 per cent. in tenor, and prove remarkably free from the impurities present in the matte, which, normally, would be expected to appear in considerable quantities in the finished product. It is evident that the inventors of this process have a wide field before them, if their claims can be fully substantiated in furnace practice.

The process of conversion first applied to steel making by Bessemer, and now in general use in the manufacture of steel, was eventually applied to copper smelting, after no little unsuccessful experimenting. The first successful plant for the bessemerizing of copper matte was built in Lyons, France, in 1881, by Pierre Manhes. This process was adopted shortly afterward at the Parrot mine, Montana, where it was greatly improved over the French practice, and from that time its general adoption for the conversion of matte into blister copper may be said to date. The process, as now in general use, consists of burning out the sulphur and allied impurities in the converters, some of which are of very great capacity, having been built as large as eighteen tons. This process is completed in one heat, and the sulphur in the matte is made to work its own destruction under the influence of the blast. The process is an economical one, but should be followed by electrolytic refining to give a pure copper of high conductivity and also to save the precious metals usually contained in blister copper.

The first converters were made of one ton capacity, but now rarely run less than ten to fifteen tons in size, in the modern smelters. The crude copper is run from the furnace into the converter in some cases, thus saving re-heating. Owing to the greater specific gravity of gold and silver the precious metals tend toward the bottom of the converter, and can be saved to some extent therefrom, but this process is so crude and wasteful that the gold and silver are now generally parted by electrolysis in a later operation.

Converters are built of steel, in various sizes, sometimes of great ca-

capacity, up to 15 or 18 tons. The boiler-plate shell is made in three parts, strongly bolted together on the flanged parts, and is lined with fire-brick, or, more often, tamped gannister, cemented with clay. In the best arranged plants the copper is run direct from the cupola well of the melting furnace into the converters, thus saving loss of heat. A blast of five to fifteen pounds per square inch, furnished by an air compressor, is then blown through the molten charge, the converter blowing off into hoods that connect with flues running to the dust chamber. The number and size of the tuyeres through which the blast enters the retort vary with the style and size of the converter, which is mounted on trunnions, and provided with mechanical power for tilting. More or less copper, volatilized by the blast, is driven off, but saved in the dust-chambers, and resmelted as flue dust. In the best practice ten to fifteen-ton converters handle full charges and turn out finished blister copper of better than 99 per cent., in one to one and a quarter hours.

Pyritic smelting is a process of reduction in which the sulphur in the ore, itself a valuable fuel, is made to work its own destruction. In ordinary smelting practice the sulphur must be driven off, with great labor and trouble, through the employment of carbonaceous fuel. This process is, of course, adapted solely to sulphide ores, and apparently to only a portion of these, as sufficient silica is required to hold the iron in slag. Whether silicious ores might not be added to sulphides deficient in silica is a matter for experiment. In practice it is usually found advisable to use a little coke to start the process of combustion, but this merely serves as kindling, the real fuel being the sulphur in the ore itself, which unites with oxygen entering the furnace and passes off as sulphurous fumes, the iron in the ore also being partially oxidized at the same time. Sulphide ores occasionally require the addition of oxide ores to serve as a fluxing agent. The first cost of a pyritic smelting plant is less than that of an ordinary smelter of the common type, and, as fuel is the greatest single item of cost in the operation of a copper smelter, the cost of operation is materially lower in pyritic smelting than with any other process. The cost of calcining is saved, and the fuel bill is reduced from 60 to 90 per cent. The atmosphere is neutral, and impurities are eliminated more readily than in other smelting. It seems the coming process for such ores as it is adapted to, but it must not be thought, from the manifest advantages of the system, that it will do for all sulphide ore properties. Its adoption should not be decided on in the case of a new mine until the best expert advice has been had, and careful consideration given to every possible factor in the case.

Pyritic furnaces are charged in two ways. In layer charging the raw crushed ore is intimately blended with a small proportion of coke, and fed into the top of the furnace, there being gradual heating until the ignition of the entire mass. A low-pressure blast is used, resulting in partially roasting the ore before it reaches the smelting point. In column charging the raw crushed ore is fed into the smelting zone of the furnace, and a strong

hot-blast aids in the process, exercising a bessemerizing effect. When properly operated a furnace worked with a column charging gives matte of good grade, with exceptionally clean slags, has a large capacity and effects a big saving in fuel.

The scoria, or worthless waste material from a smelter, accumulates in large quantities, and its disposal is a matter of importance. Various plans are in use for handling and disposing of the slags. The simplest is to let it run outside and care for itself, but this is possible only where there is a sharp incline and plenty of waste room, conditions usually lacking. The cheapest plan is, probably, to granulate the slag. This is done by running the molten slag into a trough conveying a stream of running water. The slag granulates instantly and is washed away by the water, and deposited by gravity at whatever point desired. It may also be taken out in slag-pots, by hand, horse or mechanical power, or may be run out in gutters, while liquid. One valuable use of this material is the making of slag brick, which, while not suited to general use, are frequently available about a smelter. The chemical composition and physical properties of slag vary greatly, according to the nature of the ores and fluxes used in the smelter charges, but most slags are rich in iron and silica, and make excellent brick for certain rough uses. Whether cement might be made from copper slags is undetermined. The Illinois Steel Company makes an excellent cement from its iron slags, but the excess of iron in copper slags might impair the setting qualities of a cement made therefrom.

The hydro-metallurgy of copper is a special branch of the art, and one which has reached its highest development on the Iberian peninsula, where its use has resulted in the development of several very large mines, which, without its aid, could not be worked at a profit. The use of leaching processes implies a final blowing up of the product in a blast furnace, but in the main the work is accomplished by heap-roasting, leaching and cementation, in the case of sulphide ores. Lixiviation is especially adapted to sulphide ores of low grade, but it is not every low grade ore that can be handled advantageously by leaching, as it is not adapted to ores containing considerable quantities of the ferrous oxide, manganese or lime. The leaner oxides and disseminated sulphides having quartz gangues are especially suited to lixiviation. The great disadvantage of the process is that it is very slow, and locks up enormous quantities of ore, which means a heavy investment in unavailable ores and partly finished products, at all times.

The leaching processes vary, according to the nature of the ores, and in minor details, but may be broadly divided into three groups, one for oxide ores, one for sulphides, and one for sulphates, the latter receiving the same treatment whether produced naturally or artificially. In the case of old copper openings, the waters percolating through the sulphide ores gradually leach out the metal, which is carried in solution as sulphate of copper, and can be easily precipitated upon scrap iron. The mines of the Sierra Morena, in Spain and Portugal, have been worked intermittently for at least three

thousand years, and immense piles of low-grade sulphide ores and refuse have accumulated. As these weathered, the natural lixiviation was perfected; and all that is needed to save the copper is to deposit scrap iron in the path of the leach water. Upon the iron the red metal is deposited, while the iron is gradually consumed, and turned into copperas by the free sulphuric acid set free from the leach-water. The process of securing copper from sulphate solutions is now used at many old mines, resulting in small annual production, and is employed in certain districts for saving copper from water pumped out of the mines.

The process of natural cementation is well exemplified at the San Domingos mine, Portugal. The low-grade sulphide ore is cobbled to three or four-inch size, and piled in immense heaps, 15 to 40 feet in height, which are provided with valleys for drainage, with brick chimneys at intervals. Pipes are laid over the surface of the heap, and water applied copiously at intervals. The water draining out of the heap is collected in sluices, and the metal carried in solution as copper sulphate is precipitated in metallic form on scrap iron. Such heaps may contain a million tons of ore, and require eight or ten years for leaching.

What is called artificial cementation is best exemplified at the Rio Tinto mine, in Spain. Broken ore is piled in roast-heaps, called *teleras*, in quantities of 1,000 to 1,500 tons to the heap, the ore ranging from one and a half to two per cent. in copper. The heaps are fired, burning slowly for three to six months, after which the ore, then thoroughly and uniformly roasted, is placed in cement tanks which are some five feet deep by one hundred feet long, and thirty-five feet wide, and provided with false bottoms of square timber. The ore is then leached, the leach water running into settling tanks, where the copper is precipitated on pig iron. There are five or six successive leachings, after which the leached ore is taken out, piled in heaps called *terreros*, and weathered again, for re-leaching. Some idea of the immensity of the scale on which the Rio Tinto is operated may be gained from the fact that the mine has about seven million tons of low-grade ore in *terreros* at the present time.

Copper sulphide ores are converted into sulphates in three ways. The first of these is by weathering, which induces a process of natural decomposition, as instanced in the case of the San Domingos, previously cited. The second method is that of slow-roasting, as just cited in the case of the Rio Tinto. The third system, which is employed at the Rio Tinto, and other mines, consists of roasting copper sulphides with ferrous sulphate, which converts the bulk of the product into copper sulphate. Sulphate of iron is freely produced in the cementation of copper, hence is readily available at small cost, at the Rio Tinto and other mines producing cement copper, in addition to which there is an immense supply of ferrous sulphate (copperas) produced in the weathering process preliminary to cementation, as the Rio Tinto and other Huelva ores are chalcopyrite, which is a compound sulphide of copper and iron. In the chemical reactions attendant

upon weathering, large quantities of ferrous sulphate are produced, and this, after further oxidation, reacts to free sulphuric acid and basic iron salts, the free sulphuric acid attacking the copper and changing it into copper sulphate, which is held in solution and may be made into crude commercial form by evaporation of the water, or precipitated in the form of cement copper, as is desired.

Copper sulphides may also be converted into chlorides by two processes, both of which are used in the Hispano-Portuguese cupriferous fields. In the first of these processes the sulphide copper ores are treated with ferric chloride, or with ferrous chloride and hydrochloric acid. Decomposition is hastened by saturating the ores under treatment with calcium chloride (chloride of lime), or sodium chloride (common salt). The second process, which is quicker, and also gives closer extraction, though the cost of treatment is higher, consists of roasting the raw sulphide ores with a liberal addition of salt. This is known as the dry chloruration process, and is in extensive use at the Rio Tinto, where the ores receive an addition of about one and three-fourths per cent. common salt, and the mixture is roasted in teleraas. The chlorurized ore is then leached in vats, as already described, and the residuum is placed in terreros for further weathering and ultimately a second leaching. A modification of this process is in use at Natrona, near Pittsburg, where residues of Spanish pyrites used in the manufacture of acid are treated by what is practically the same process, though conducted somewhat more expeditiously and expensively. The process is also in use at several Canadian and American points, on a small scale.

The Doetsch leaching process is not in present use, though once employed extensively at the Rio Tinto. This system provides for the treatment of raw sulphide ores, which are mixed dry with about one-half per cent. of ferrous sulphate and salt. The ore is broken to half-inch size, and with the ferrous sulphate and salt is built up into large heaps having channels and chimneys for ventilation. In about two years the weathering is completed, and the copper held in solution in the leach water, amounting to about 80 per cent. of the assay value, is precipitated on iron.

The earlier wet process of Langmade was improved by Henderson in 1860, and remains, with slight modifications, in quite extensive use. It is designed for the extraction of copper from the cinders of cupriferous iron-copper pyrites remaining after the extraction of the sulphur used for the manufacture of sulphuric acid.

The Hunt & Douglass process is an improvement upon the Doetsch leaching process, and while based upon the same general plan, is a modification better adapting the system to the economical work that is now necessary for the earning of profits in the copper trade.

The cement copper resulting from the precipitation of copper from cuprous sulphate solutions upon scrap iron is a very impure mixture of metallic copper with iron, antimony, arsenic, silica, etc., and is washed before reduction to blister copper in blast furnaces.

The principle of electrolysis, or the parting of metals and the redepo-

sition of one of them by the aid of a continuous electric current, was discovered by Faraday in 1839, but was not applied practically to copper refining until 1881, when the Balbach smelting works at Newark, New Jersey, put in a small electrolytic plant. Despite the obstacles met with at the start, the process gave such promise of success in the perfect separation of copper and its allied metals that its introduction was rapid. The process was improved speedily, and three years after its first use in the United States electrolytic plants were in operation in Wales, England, France and Germany. For the refining of blister copper it has no competitor, and is now the cheapest as well as the most thorough process for the refining of all rough coppers.

The process of electrolytic refining, producing copper of that name, is a step in advance of the old methods that produced copper of merchantable grades, though containing considerable impurities, of which gold and silver, especially the latter, were the principal. It being evident that the precious metals did not add to the value of the copper, but were themselves of great value if it were possible to separate them from the copper, various plans for parting the metals were tried, but none of them were completely successful until the perfection of the system of electrolytic refining.

There are two principal systems of electrolytic refining, with a variety of modifications of each. These are known as the series and multiple systems. The former has electrodes in series and tanks in series, or, more frequently, in multiple series. The multiple system has electrodes in parallel arcs, with tanks in series. The series system requires a much greater electromotive force than the multiple plan, and the latter is in more general use. There are a dozen electrolytic refineries in the United States, and no two of them are built or conducted on exactly the same plan, though the main features of the work are similar, the modifications being principally in the minor details. The success of the entire system hinges upon the fact that under electrolytic action metals are dissolved at the negative pole of a battery, and redeposited at the positive pole, when free circulation is permitted in a favorable solution. Varying electric currents give varying effects, and some metals pass over sooner than others, copper being one of the first to go over. As the unrefined copper contains a variety of metals in most cases, it is important that the electrical current be so regulated that none of the other metals pass over at the same time as the copper, or the object of the work is defeated. Not only must the current be carefully regulated, but the nature and circulation of the electrolyte are of prime importance, in securing thorough and economical practice.

Connections between dynamos and tanks are made of high-conductivity copper, necessarily of large size to carry the heavy current used, and of varying forms in cross-section. The tanks may be of wood or slate. The wooden tanks are usually lined with lead, tarred felt, or asphalt, lead being preferable. These tanks usually have their tops about flush with the floor, to permit easier handling of material, and are terraced in series, thus providing for a natural circulation of the electrolyte, which is pumped into the upper tanks, and flows thence, by gravity, into the other tanks of the

series. Overhead trolleys, running along the galleries and aisles between the tanks, provide expeditious means for bringing in the anodes and taking out cathodes, which, in a large plant, are constantly being added and withdrawn, although the making of a single cathode requires several weeks. The anode bars are cast from blister copper, usually running from 98 to 99.5 per cent. pure. These may be made at the smelter, or cast at the refinery from blister copper melted in a cupola furnace kept running for the purpose. Anodes are cast in a variety of forms, but more commonly are thin plates with projecting lugs that rest on the top of the sides of the tanks, one lug resting on the electrical conductor, while the other is insulated.

The composition of the electrolyte varies at the different plants, containing from 5 to 6 parts of sulphuric acid, 15 to 20 parts of bluestone and 75 to 80 parts clean water. The average composition is 16 to 18 parts bluestone, and 6 parts of acid. The heating of the electrolyte promotes the process of decomposition and upbuilding, and produces a smoother deposition of copper on the cathode.

The cathode plates are made of strips of rolled copper about one-quarter inch in thickness, and of varying sizes and forms. These are made from copper sheets, then oiled and coated with fine graphite, to assist in electrical deposition. The process of refining is necessarily continuous, to secure the best results metallurgically and financially, but from two to four weeks is the average time required in making an average cathode. Including the time required in remelting and in various other uses, it may be said that five to six weeks time is required for the making of finished cathodes from the rough copper received, though a much shorter time may suffice in some plants, under exceptionally favorable circumstances. The rate of progress secured depends quite largely upon the purity or impurity of the anodes, the process of electrolysis being greatly facilitated and cheapened by comparatively pure anodes.

As the anodes are torn down and the cathodes built up under the steady effect of the powerful electric current, the pure copper, with minute traces of the impurities present in the anode, is carried over to the positive pole. The great bulk of impurities in the anode are precipitated to the bottom of the tank, as sludge, or slimes. A certain infinitesimal amount of the impurities present in the anode will find their way into the cathode, but not to sufficient extent to injure the product for any commercial use. If more than traces of the impurities are carried over, it is because the electrolyte has become foul, or the current is wrong, or there has been serious carelessness somewhere. The chemist at an electrolytic refinery earns his full salary, for he must be working every minute he is on duty, as frequent assays of anodes and cathodes, and at least tri-weekly determinations of the electrolyte are required. There are local aberrations peculiar to the process which are liable to affect any or every tank, and even individual anodes, requiring constant watchfulness from superintendent, electrician and chemist. The sludge precipitated to the bottom of the tank may form a conducting plate, giving rise to short-circuiting, and should be removed

before large accumulations occur. When the electrolyte becomes too foul for proper use, it is purified, brought up to the proper standard, and pumped back into use again. The slimes at the bottoms of the tanks are siphoned or bailed out, taken to the slime tank, and copper scraps picked out by hand, after which the copper remaining therein is dissolved out by a solution of two to three parts 66 degree sulphuric acid with one part water. The remainder of the precipitate, which may contain gold, silver, tin, lead, zinc, antimony, bismuth, etc., is washed, dried, mixed with soda-ash and then smelted down to base bullion, from which the gold and silver are parted in the usual manner.

The electrolytic refining of copper has been greatly improved during the past decade, and is now in very general use. In 1892 the output of electrolytic copper was about 25,000 tons. Three years later it was 87,000 tons, while in 1898 the output was estimated at 157,000 tons, and for 1902 was probably nearly 250,000 tons—a gain of ten-fold in ten years. The process is in such general use because it serves a two-fold purpose, saving the gold and silver values which had been partially or wholly lost before its adoption, while also producing a product of uniformly high grade. Although Lake copper is best suited for certain uses, and there are other excellent brands not produced electrolytically, the fact remains that electrolytic copper is now the standard of the world, and bids fair to remain such until something akin to a revolution in metallurgy shall give us a refining process better or cheaper. The cost of refining a ton of crude copper by electrolysis varies greatly, ranging from about \$10 up to probably nearly \$25, with \$12 to \$14 as the average figures. Unlike smelting, which can usually best be done near the mine to save excessive freight charges on worthless material, electrolytic refining is performed in most cases nearer the consumer than the producer. The extra freight paid on the very small percentage of impurities in blister copper is so very small a fraction of the total transportation charge that this loss is more than offset by the advantages offered by the cheaper labor, cheaper fuel, and better transportation facilities that are found along the Atlantic seaboard in the United States, where a considerable amount of foreign copper is refined, as well as the bulk of the domestic production.

The possibility of electric smelting has long excited the interest of scientists and practical metallurgists. Various laboratory experiments have resulted well, but it is not a matter of record that any electric furnace is in successful commercial operation. Claims have recently been made that refined copper can be produced direct from mattes, or even from ore, by electrolysis. These claims remain to be demonstrated.

CHAPTER V.

THE USES OF COPPER.

The three indispensable metals of the present age are iron, copper and zinc. The loss of tin, nickel, lead and aluminum would be a severe blow and work great hardship, and even were we to be deprived of such apparently insignificant metals as antimony, cobalt, manganese and platinum, the industrial world would suffer a loss that would entail very disastrous consequences. The taking away of gold and silver, and that useful thief-taker, mercury, which catches most of the world's gold supply, would reduce the globe's finances to chaos. Iron and copper, however, are the main pillars of the metallic structure, while zinc, in addition to many other virtues, possesses the unique quality of being the only electrically negative metal, and without it, copper, for electrical purposes, would be like a "pair" of scissors with but one blade.

The uses of copper are many, and great industries are dependent upon this metal, which affords direct employment to some hundreds of thousands of persons, mostly skilled workman, and annually adds something like five hundreds of millions of dollars to the wealth of the world. The Stone Ages of humanity were followed by the Bronze Age, in which copper and tin were the only metals used, unless the wearing of a few gold and silver trinkets could be said to establish the use of those metals. The Age of Iron followed that of Bronze, and the Steel Age of the latter half of the Nineteenth century is but a later and higher development of the Iron Age, just as the polished stone weapons of the Neolithic Age of ethnologists indicate a period of adaptation and improvement upon the cruder weapons and implements of an earlier day. While iron and steel are not only holding their own, but gaining ground in phenomenal strides, another metal has arisen to claim at least a portion of the honors of Twentieth century civilization, and copper is the foundation of the Electric Age, just as it was the fundamental metal in the Age of Bronze, some milleniums ago.

Of the many uses of copper, electricity is easily the most important. From a plaything for philosophers, in the times of Franklin and Volta, electricity has become one of the prime factors of the life of the present day, and, unless all signs fail, the uses that we consider multifarious, and the installations that we deem immense, are but the precursors of yet better and greater things, of which we may sometimes dream, and from which unsubstantial fabric the flash of Genius and the fires of Labor will bring forth the perfect fruit, for the use of generations yet unborn. A full enumeration of the elec-

trical uses of copper would require a volume, rather than a few paragraphs in a single chapter. The metal is an integral factor in all electrical installations, and for the transmission of power, light and telegraphic or telephonic impulses, is a necessity. The iron wires of pioneer telegraph and telephone lines are rapidly giving way to copper strands. Iron is low in electrical conductivity, making it an inefficient and costly medium for transmission. It is also subject to rust, and its lack of the ductility which is such a prominent characteristic of copper, causes iron wires to break from winds and sleets that would not injure lines of copper. Iron telegraph and telephone wires are still used to a much larger extent than generally imagined, owing to the cheap initial outlay, but the cost of maintenance and repairs renders it certain that iron must give way, sooner or later, at all points, to copper.

The electric light was the luxury of great cities two decades ago; now it is the necessity of every progressive village of so many as a thousand souls. But a quarter century gone, telephones were a scientific toy to the enlightened, and something uncanny and dangerous to the ignorant. Today a network of wires stretches across the American Continent, and Stockholm, upon the banks of the Malar, has one 'phone for every family of its population. The business man at his desk talks with his broker a thousand miles away. The Calumet & Hecla copper mine, one of the world's greatest properties, has telephones nearly a mile below the earth's surface. Timbuctoo shall have them too, before the century's past, and to the pole that's now our goal, we'll telephone at last.

Only fifteen years ago the electric railway was looked upon by conservative persons as a trumpery sort of experiment, scarcely able to deprive the long-eared mule of his appointed mission as motive power for the American street-car system. But where is the mule to-day? His bones lie whitening upon the veldt of South Africa—British South Africa now—and the street cars know him no more.

Electric heating is yet an experiment, but its day will come. Electricity must play a more and more important part in the world's manufactures, both as a motive power and a reducing agent. In the happy days of the future the struggle of coal barons with rebellious workmen will no longer distract a public desirous of fuel for hearth and workshop. In fifty years, or less, the owners of the waterfalls will be the men on whose devoted heads the vials of wrath will be poured out, for they will furnish the heat and power, and will reap the reward of great riches, with corresponding unpopularity. Great as has been the electrical development of the past two decades—and it really began in earnest only a quarter of a century ago—the future assuredly will discount the past. Power, heat and light that can be summoned by the turning of a switch, or the pressing of a button, will, of a certainty, displace the power that comes from laborious stoking; the heat that comes with delay, and much soot and smell, and leaves ashes behind; and the light that comes of striking many matches, and with the effusion of kerosene that is odoriferous. Electric power is already the cheapest form of energy, where waterfalls are used. Electric light is growing both better and cheaper. Electric heat, while dear for ordi-

nary use, at present, will become cheaper. The use of electricity for power, heat and light must become well-nigh universal, in time.

Next to its electrical uses, copper is most extensively employed in engineering; every modern engine has brass oil-cups; brass and copper tubing is used in many boilers; brass, gun-metal, bronze and composition copper bearings are a necessity. Copper and brass boiler tubes are used in locomotives and other high type boilers, having ability to withstand enormous pressures, and being excellent conductors of heat. Copper tubes are used almost exclusively in marine condensers. Until the era of iron vessels, prudent ship-owners sheathed the hulls of their craft with copper, which kept the bottoms clean. Within the past few years this practice has been renewed, with modern steel steamers, on which it is necessary to plank over the hull below the water line, in order to give a backing for the riveting on of the copper sheets. The loss in speed, and consequent loss in time and fuel, brought about by barnacles gathering on iron and steel bottoms, is very great, and the cost of dry-docking and scraping, with loss of time entailed thereby, is probably considerably greater than the expense of wood-sheathing and coppering iron and steel vessels below the water line. Eventually some method will be devised for the plating of copper directly on the steel bottoms of the boats.

Copper is used extensively in architecture, as roofing for buildings, either in sheets or tile form, and in cornices. For the latter use copper is considerably more costly than galvanized iron, but its freedom from corrosion, and its rich appearance without painting, render it desirable for ornamental cornice work on the better class of buildings. Bronze gates and doors for churches and public buildings are highly ornamental, and the most desirable that can be made. Bronze grille work is frequently used, and its richness and permanence cause it to be regarded favorably. In builders' hardware, brass, bronze and copper locks, knobs, escutcheons, butts, bolts, catches and drawer pulls are in steadily increasing favor and use, and from the superior durability and appearance of copper and its alloys, will continue to displace iron in a greater ratio, as the nations increase in wealth and the standard of living is raised. Brass rods for portieres, curtains and stair carpets are in favor. Brass pipes and faucets, usually nicked, are used in the best plumbing, for bathrooms and lavatories, on land and sea, and in railroad sleeping-cars. Extensive use is now made of brass rods in devices for window displays and in various mechanisms for exhibiting goods, in retail business places.

The domestic uses of copper and brass are varied. Brass beds and furniture attract by their cleanliness, beauty and durability. Brass or copper lamps, for kerosene oil, are more durable and ornamental than those of glass and other materials, and also far safer. The consumption of high grade brass piping and castings, for gasoliers and electroliers, is enormous, and constantly increasing, displacing the crude iron pipes and castings of the preceding generation. In the kitchen the brazen kettles of earlier days are losing ground. There is no material better fitted for cooking, when carefully cleaned, and none that may cause so much trouble, if neglected.

Within the past few years, copper has been used for roofing passenger coaches of railroads, with good results. The ideal passenger car of the future will have a steel frame, a copper roof, a wooden interior finish with brass fittings, and paper wheels.

Wherever there are waterworks, brass faucets and valves will be found. The consumption of brass for valves is enormous, and for very many uses these valves, while very costly in the larger sizes, are economical in the end.

For more than two thousand years statues have been made of bronze. Iron turns to rust, wood decays, and marble is discolored, but bronze retains the beauty and finish of the sculptor, and is subject to a slight corrosion only, in the course of ages, when buried in the earth. For decorative purposes bronze is used for vases, urns and similar ornamental receptacles.

Copper and its alloys have been employed for coinage from time immemorial. Originally copper was a purely money metal, like gold and silver, and each copper coin, unless debased by the short-sighted cunning of the petty tyrant, oligarchy or democracy of the day, represented upon its face merely the intrinsic worth of the metal contained. The inherent impossibility of keeping three separate metals upon any fixed parity led to the relegation of copper to the status of token money, for the same reason that silver coins were made merely a token money also, by the leading commercial nations of the globe, during the century just passed. The Chinese still give honest values in their brass money, and the experience of Europeans, who require a coolie with a wheelbarrow to carry around the change for a gold sovereign, is typical of what would be the case over the entire world if copper had not been eliminated from the list of purely money metals. The annual consumption of copper for coinage is much greater than would be anticipated by anyone who has not given the matter a little investigation.

The followers of Mars are liberal consumers of copper. The brass cannon, so popular fifty years ago, are now used mainly for firing salutes, ornamenting public squares, and trading to the heathen. Notwithstanding the disuse of the metal for ordnance, except in small salute-guns for yachts, more copper is now used for munitions of war than was ever consumed in the casting of cannon. Brass and copper cartridge cases, cold stamped from tough sheets, are consumed annually to the extent of hundreds of millions, by the world's armies, for machine guns and small arms, and to a scarcely smaller extent by hunters. Hundreds of tons of the best tough metal are consumed annually, merely to make the brass buttons that decorate the uniforms of the world's armies and navies. Brass fittings and buckles for men and horses, brass canteens, drinking cups and cooking utensils, also require much copper. It is probable that copper must give way to aluminum for these latter uses, throughout the world, as aluminum is lighter and tarnishes less easily. The copper exploders, used in every metal mine where modern methods are employed, afford another use, apparently trivial, yet which is one of the scores of minor demands that in the aggregate foot up thousands of tons annually.

In the arts and manufactures copper plays a highly important part. The great vacuum pans of the sugar factories and refineries are made of copper.

There are copper vats in pulp and paper factories. The worms and stills of distilleries are of copper, and the copper brewing kettles in which beer is made are of immense size and numbered by thousands. There is scarcely a manufacture that does not make more or less use of copper or brass, in some one or more of the processes employed. The works and cases of Yankee clocks, now to be found in the most remote corners of the earth, are of brass, as are the gear wheels and pinions of watches and other instruments of precision. The manufacturers of scientific instruments and optical goods are excellent patrons of the brass-founder. From him are obtained the alloyed metal that, under many forms, as sheets, tubes, rods, wires and castings, make up the bulk of the construction of microscopes and telescopes, of surveyor's transits and draughtsman's protractors, and of the many strange instruments of marvelous complexity and variety that do human work without the element of human fallibility.

The textile manufacturers use copper rolls for stamping patterns upon calicos and print cloths. Brass platens upon typewriters are used to aid in manifolding. Signs of copper and brass stare at us from every corner of crowded city streets. Copper leaf is used by sign writers and in other ways. Communited copper is used for bronzing.

The uses of copper enumerated in the preceding paragraphs of this chapter are for the metal and its metallic alloys. There are alloys, such as nickel-copper, arsenic-copper, aluminum-copper and others, hitherto unmentioned, which are used for a variety of special purposes. In addition to the uses of copper and its metallic alloys, there are highly important utilities for various ores and compounds of the metal. Malachite, when found massive and pure, is a semi-precious stone of great beauty and much in demand for table-tops and interior architecture. Other ores are ground up for pigments, several beautiful shades of green and blue being secured from mixtures having copper ores as bases.

The most important copper mineral, for other uses than the production of metal therefrom by smelting, is sulphate of copper, the common blue vitriol of commerce. This is occasionally found in nature, as chalcantite, but is almost invariably a product of manufacture. This compound is one of the most important chemical agents known to science and industry. It is a necessity in the electrolytic refining of crude copper. It is a component part of all wet batteries, and as such rings our door-bells, transmits our telegrams, and is the energizing agent that permits the transmission of the human voice over the wires of the telephone. In electro-plating, electrotyping and kindred industries, it is the prime factor. As an insecticide it stands without an equal; dilute solutions of sulphate of copper stayed the ravages of the phylloxera when the vineyards of France seemed doomed. It is probable that not less than one hundred thousand tons of copper sulphate, containing a quarter of its weight in metallic copper, is consumed every year in spraying the vines and fruit trees of Europe and America, and thus it may be said that it is to copper that we owe the sparkling wines of France, the peerless American apple, and the blushing peach that reaches perfection on every continent.

The consumption of sulphate of copper is not confined to viticulture and the electrical industries, as it is consumed by the thousands of tons monthly in the textile factories, in the chemical industries, and in manufactures of lines so varied as to make their mere enumeration fatiguing.

The question of substitution of other metals is one that comes up periodically. Aluminum is often mentioned as the metal that is to displace copper almost entirely. There is little likelihood of such a consummation, unless aluminum can be made at a fraction of its present cost. Aluminum is the most common of all metals, being the base of every clay, but it is reduced with great difficulty, and at heavy cost, by electrolysis, but it is a useful metal, with a distinct sphere of its own. Several of its alloys are of much utility, and the pure metal, owing to its lightness, is available in many places where steel and copper are less desirable. Aluminum has fair electrical conductivity, but is not apt to replace copper to any great extent for electrical uses, unless aluminum goes down and copper goes up in cost.

In lines other than electrical copper has many substitutes. These come into use when the metal is high, and go out when the cost of copper falls. Like all other commodities, copper finds its level. High prices encourage substitutions and decrease consumption in other ways, while low prices encourage the substitution of copper for other materials in many places. The true value of copper is, like the true value of all other commodities, the price at which enough metal can be produced, at a fair profit, to supply the world's legitimate requirements at a reasonable price. An era of high prices stimulates production and restricts consumption, with an eventual collapse of prices and trouble to producers. An era of low prices restricts production, stimulates demand and plainly foreshadows future grief for the consumers.

The era of copper manipulation, beginning in 1899 and ending early in 1902, was marked by unnaturally high prices, greatly restricting consumption, followed by abnormally low figures that caused the speedy absorption of the large surplus of metal previously stored up by reason of unduly high prices. The course of the metal market during 1903 was more regular and more free from manipulation than since 1898, but the suspicions of purchasers remain active. Having suffered from previous interference with the natural law of supply and demand in the copper market, it is but natural that they should fear further tactics of the same sort, and weigh the evidence at hand quite closely, before making market commitments.

The best interests of producers and consumers alike will be served by a perfectly natural market, in which the level of prices is determined by the supplies on hand and the consumptive capacity of purchasers. Copper consumers are prone to think that the abnormally high prices of 1899-1901 were secured solely at their own cost, yet as a matter of fact the producers suffered also, to no small extent, from the selfsame inflation. By reason of the unduly high prices then ruling many new mines were opened, to compete with those already developed, and their competition, brought about by the era of high prices, became effectual after prices had dropped sadly. Not only this, but the cost of producing copper advanced materially by

reason of the high market price. Costs were increased, not only through higher wages paid workmen, but by reason of a general slackening of vigilance in guarding small leaks, it seeming impossible for any corporation to be as careful in good times as in an ordinary season. It has taken the better mines several years to get back, even partially, to the vantage ground of costs occupied before the era of boom prices that begun in 1898.

CHAPTER VI.

GLOSSARY OF MINING TERMS.

In this section of the Copper Handbook the glossary, first appearing in the 1902 Edition, has been materially amplified, and will be found to give nearly all of the terms used in copper mining, milling and smelting.

ACID. An acid rock is one in which bases are combined with acids, forming salts. The antithesis of basic.

ADIT. A tunnel. A mine opening, driven from the surface into a hill or mountain, on practically a horizontal plane, only enough rise being allowed to provide for natural drainage and to allow the easy removal of cars bringing rock from the breast of the working. An adit can be driven only where the surface is mountainous or quite hilly.

ADOBE. Sun-dried brick.

AIR-BLAST. A violent explosion, caused by the escape of air compressed by the settling of the upper workings of a deep mine.

AIR COMPRESSOR. A machine for condensing air to a pressure sufficient to actuate machinery, when delivered underground or elsewhere at a considerable distance.

AIR-DOORS. Owing to strong currents of air frequently found in the depths of mines, it is sometimes necessary to build a little chamber in a drift connecting two shafts, with a door at either end, to prevent the strong air currents blowing out the lamps and candles of the miners.

AIR-DRILL. A power drill operated by compressed air.

AIR-SHAFT. A shaft sunk solely to provide ventilation for deep workings, or else an old shaft kept open solely to furnish air to the mine. Nature provides a means of ventilating even very deep mines. Two shafts, one of which is sunk on slightly higher ground than the other, will provide natural ventilation underground as soon as connected by a drift. The longer shaft becomes a chimney and the shorter an inverted syphon, down which the air is sucked with great force.

ALKALI. An alkali is a lye—the opposite of an acid.

ALLOY. Two or more metals united mechanically, but not chemically, by fusion.

ALLUVIUM. Soil or broken rock deposited by the action of water.

ALTERED. A rock that has undergone changes in its chemical and mineralogical structure since its original deposition.

ALUMINOUS. A rock having aluminum as a base or prominent constituent element.

AMALGAM. A union of mercury with other metals, such as gold, silver or copper. Mercury will not amalgamate with iron.

AMALGAMATION. The process of uniting gold, silver or copper with mercury. The quicksilver is expelled later by heat and recovered for further use.

AMORPHOUS. Without form.

AMYGDALOID. A trap rock, of igneous origin and frequently of highly complex structure, the name coming from the little pits or amygdules of softer rock-material found therein. In the Lake Superior copper district the copper-bearing amygdaloids frequently show the native copper in the amygdules left by the leaching out of the softer rock originally contained therein.

AMYGDALOIDAL. Of the nature of or akin to an amygdaloid. Word used in England, in place of amygdaloid.

ANALYSIS. A complete chemical test of any given substance.

ANHYDROUS. Devoid of water.

ANTICLINAL. A fold of rock-strata bulging upward, in saddle-shape. The reverse, geologically, of synclinal.

ANTIMONIDE. An ore of any metal or metals chemically united with antimony.

APEX. That part of an ore vein at or nearest surface. Usually requires opposing experts and several lawsuits to determine. In case of litigation the apex is usually owned by the litigant having the most money.

APICES, Apexes.

ARASTRA. A Chilean mill. A circular trough, in which broken ore is pulverized by a revolving wheel or mill stone.

ARENACEOUS. Of a sandy nature.

ARGENTIFEROUS. Silver-bearing.

ARGILLACEOUS. Of a clayey nature.

ARROBA. A weight of varying heft. Spanish, 25.36 pounds avoirdupois. Portuguese, 32.38 pounds.

ARSENIDE. An ore of any metal, or metals, with which arsenic is chemically united.

ARSENOPYRITE. An ore of any metal or metals with which arsenic and sulphur are chemically united.

ASSAY. A chemical test of ore or metal to determine its exact content and value in any given metal or metals.

ASSESSMENT WORK. The amount of work required annually by the United States government, from the holders of an unpatented mining claim.

ATTLE. Cornish term for waste rock.

AURIFEROUS. Gold-bearing.

AUXILIARY. An auxiliary engine or machine is one kept in reserve, for use when the principal machine is idle for repairs or other reasons.

AVERAGE PRODUCE. Cornish term for percentage of copper in ore.

BACK. The roof of rock above any mine opening driven on a horizontal plane.

BAD AIR. Air in which miners cannot work, due to powder fumes, noxious gases or insufficient ventilation.

BAL. Cornish name for a mine.

BALANCE BOB. A counterweight for pump rods.

BALL HEAD. A steam stamp, so called because invented by a man named Ball.

BALL STAMP. A Ball head.

BARILLA DE COBRE. Spanish term for native copper, dressed, but unsmelted. Equivalent to the "mineral" of Lake Superior mines.

BARREL WORK. Copper in small masses, detached from its rock-matrices at the rock-house, and shipped in barrels direct to the smelter. Small masses, of a size to put in barrels.

BARROW. A wheelbarrow; also same as burrow.

BARTLETT. A Bartlett concentrating table.

BASALT. A trappean rock.

BASIC. A rock in which metals are combined with alkalies, such as potassium, sodium, etc.

BASIN. A synclinal; a trough in the earth's surface.

BATTERY. A set of gravity stamps, usually five in number, but sometimes less.

BEARING. The bearing of a mineral outcrop is its strike.

BEATING AWAY. To cut down or stope a mineral body.

BED. A stratified rock formation. Used in some mineral districts to mean veins or lodes lying horizontally, or approximately so.

BED-ROCK. The solid rock as differentiated from loose or surface rock. The ledge.

BELLS. Signals for lowering and hoisting the bucket, skip or cage in a shaft are usually given by bells, the number of strokes indicating the nature of the load, the place for landing, etc.

BIT. A steel drill. A short hollow cylinder of soft steel, used in diamond drilling. The diamonds are set around the inner and outer edges of the bottom of the bit and cut away the most refractory rocks when the bit is rotated.

BLACK COPPER. Copper partly smelted, but containing impurities requiring refining.

BLACK JACK. Zinc blende.

BLAST. To explode dynamite or black powder. Air forced into a furnace to aid in reducing the ore charge.

BLASTED. A miner that has been blasted is one who has been injured by the explosion of a charge of dynamite or gunpowder.

BLASTING. The breaking of rock by means of high explosives inserted in holes bored in the rock for the purpose.

BLLENDE. Zinc blende.

BLIND DRIFT. A drift connected with the other workings of the mine at one end only. A cul de sac.

BLIND LODE. A lode that does not come to surface.

BLIND SHAFT. A shaft not coming to surface. A winze.

BLISTER COPPER. Copper of 96% to 99% pure.

BLOCKHOLE. A hole for explosives drilled in a mass of ore or rock already broken from the vein, but too large to handle.

BLOCKING OUT. To open the ore in a mine so that it can be won merely by stoping.

BLOSSOM. An outcrop of an ore body altered by weathering.

BLOWER. A fan used to force air into a mine.

BLOWING IN. A furnace or smelter is blown in when charged and the process of ore reduction begun by fire.

BOILING SHAFT. A sand-shaft in which quicksand and water boil up from the bottom.

BONNET. The cover or roof of a cage.

BORE HOLE. A drill hole bored for test purposes.

BORT. A form of crystallized carbon between the diamond and the black diamond.

BORTZ. Bort.

BOTTOMS. Impure copper formed below the matte, in matting copper ores.

BOULDERS. Detached masses of rock, rounded by attrition, usually found at or near the surface, in alluvial deposits lying above stratified rocks.

BOX CANON. A canyon closed at one end.

BRANCH. A vein branching off from the main ore body.

BRATTICE. A screen for the regulation of air currents in a mine opening.

BREAST. The face or working end of a drift, stope or adit.

BRECCIA. A conglomerate rock, in which angular fragments of rock are cemented together.

BRECCIATED. A rock stratum made up of sharply broken fragments, partially or wholly cemented together.

BROKEN. A vein is broken when lacking clearly defined walls or characteristics of regularity.

BROKEN GROUND. Rock strata where the walls are poorly defined and the general formation unsettled.

BROOD. Cornish for waste ore, such as mundic or zinc blende, where found in connection with copper ores.

BUCKET. A kibble. An iron or steel bucket used for hoisting in a mine. In a vertical shaft a bucket swings free in ascending and descending, but in an incline shaft the bucket runs on a skidway of plank or timbers, or else rides a trolley cable.

BUDDLE. A conical table on which ore is dressed. Machine and name both growing obsolete.

BULKHEAD. A wooden or masonry partition walling off a mine opening.

BULLION. Refined gold or silver before coining. Sometimes erroneously applied to copper.

BULLION BARS. Unrefined gold and silver secured by melting the precious metals precipitated to the bottom of the tank in the electrolytic refining of argentiferous and auriferous copper anodes.

BUNCH. A pocket exceptionally rich in mineral.

BUNCHY. An ore body given to considerable variations in width or values, or both.

BURDEN. Overburden.

BURROW. See rock burrow.

CABLE. The steel wire rope used in shafts for hoisting buckets, skips or cages.

CAGE. An elevator used in vertical shafts for hoisting mineral and for lowering men, timber, etc.

CAKES. Copper cast in cakes.

CALCAREOUS. Of a limey nature.

CALCINE. To drive off sulphur or other volatile constituents of an ore by heating.

CALCITE. Crystals of calcium carbonate.

CAM. A curved tooth, fixed on a shaft, for lifting the pistons of gravity stamps.

CAMP. A mining town.

CANON. (pronounced canyon). A deep gorge with precipitous walls.

CANYON. A canon.

CAP. The top piece of a framed set of mine timbers: copper caps containing fulminate of mercury, used to explode dynamite in blasting rock. The fuse is cut to proper length, one end placed in the cap, and the cap inserted in a pasty dynamite cartridge. The free end of the fuse is fired, and the explosion follows quickly or tardily, as the fuse is cut long or short.

CAPPING. The rock or other ground overlying the mineral body of a mine.

CAP-ROCK. Capping.

CAPTAIN. A man in charge of mining work is termed a captain. The mining captain is the executive officer underground.

CARBONACEOUS. Of a coal-like nature.

CARBONATE. An ore of any metal or metals with which carbon and oxygen are chemically united.

CARBONIFEROUS. Rocks of the geological ages usually associated with coal measures.

CARGA. A Mexican weight equalling 300 pounds avoirdupois.

CARTRIDGE. Dynamite put up in cylindrical cases of oiled paper to fit the holes bored by the drills.

CASING. The wooden lining of a shaft; an iron pipe put down outside of a diamond drill hole when passing through soft or broken ground, to prevent the hole becoming clogged by matter intruding from outside.

CASTING COPPER. Refined copper better suited for casting into various forms than for drawing into wires or rolling into sheets.

CAVE. A natural opening or "vug" in a rock formation; the partial or complete falling-in of a mine.

CAVING SYSTEM. A plan of mining, by which the worked out upper levels and surface are allowed to subside gradually as the mine workings are deepened.

CEMENT COPPER. The impure metal obtained from ores by leaching processes.

CERRO. Spanish for a hill showing rock outcrops.

CHAMBER. A large stope.

CHAPEAU DE FER. French for gossan or iron hat.

CHARGE. The amount of ore, flux and fuel required for one filling of a furnace.

CHIMNEY. An ore chute.

CHERT. A coarse flint containing calcium.

CHILEAN MILL. An arastra.

CHILE BARS. Bars of Chilean blister copper, weighing about 200 pounds each.

CHLORIDE. The ore of any metal or metals united chemically with chlorine.

CHURN DRILL. A drill having a churning motion, used for boring test-holes, or wells.

CHUTE. A section of a lode or vein differing by being much richer or leaner than the average.

CLACK. A pump valve.

CLAIM. Public land staked off and claimed by a prospector or miner. Size of claims varies in different countries.

CLAY COURSE. A seam of clay between vein and wall.

CLAY SLATE. An argillaceous slate.

CLEAN-UP. The cleaning up of accumulated ore or metal in a mill or smelter.

CLEAVAGE. The parting of rock along more or less regular lines of least resistance.

COARSE JIGS. The jigs used to handle the heavier grades of ore or metal.

COARSE METAL. Matte resulting from the first smelting.

COBBING. Breaking masses of ore into lumps by hand hammers.

COLLAR. The top of a shaft—the surface timbering of a shaft.

COMPANY ACCOUNT. Miners and other underground employes working on fixed wages per shift or month are usually called "company 'count men" to distinguish them from miners working on contract.

COMPARTMENT. Mining shafts are usually divided into two or more compartments, separated by framed timbers and planking.

CONCENTRATES. The concentrated ore or metal, after elimination of gangue rock.

CONCENTRATION. The process of separating native metal or ore from its gangue of worthless rock.

CONCENTRATING TABLES. Concentrators.

CONCENTRATOR. A plant where ores are concentrated; a jig. A machine for separating ore or metal from gangue-rock, the process usually employing a rocking or oscillating motion, aided by jets of water, whereby the worthless gangue is driven off and the heavier mineral retained by specific gravity.

CONDUCTIVITY. Electrical conductivity is measured by the resistance offered to the passage of an electrical current.

CONGLOMERATE. A pudding-stone rock formed by deposition of rock particles on old sea-beds, afterward covered by other rock strata.

CONSTRUCTION ACCOUNT. Many of the Lake Superior copper mines summarize their finances so that the cost of operation is divided into two classes, one being for general working expenses and the other for construction account. The latter includes new buildings and machinery on surface, and frequently new mine openings. In effect the construction account of a mine is like the stock account of a merchandise firm, and sometimes, like charity, "covers a multitude of sins."

CONTACT VEIN. A mineral body found between two unlike rock strata.

CONTOUR. The outline or configuration of any given tract.

CONTRACT. Many miners work on contract, agreeing to sink, drift or stope at a fixed price per running foot, or per fathom. These are known as contract-miners, and are usually the more skilled workmen.

COPPER ORE. See detailed descriptions of copper ores and copper-bearing minerals in chapter on chemistry and mineralogy.

CORE. A drill core.

CORNISH PUMP. A form of mine pump actuated by long rods reaching from surface down the shafts.

CORNISH STAMP. A gravity stamp, in which the heads are raised by cams and dropped by gravity.

COST BOOK SYSTEM. A plan of mine operation, used in Cornwall only, by which shares are subject to unlimited assessment. A sort of unlimited partnership.

COSTEANING. Developing. Proving an ore body by trenching across its outcrop at approximately a right angle.

COUNTERBALANCE. Hoisting plants are usually worked in counterbalance for deep shafts. The weight of the descending cage or skip is used to partially offset the weight of the cage or skip ascending.

COUNTER VEIN. A cross vein, running at approximately right angles to the main ore body.

COUNTRY ROCK. The predominant rock form of the district.

COURSE. The direction or strike of a mineral body.

CRAB. A hand winch.

CREEPING. The movement caused in mines by the pressure of superincumbent and adjacent rock masses.

CROPPINGS. Outcrops.

CROSS COURSE. An intersecting vein.

CROSSCUT. An opening similar to a drift, except that the crosscut is sent at approximately right angles to the formation, while a drift follows the trend of the lode or vein.

CRUCIBLE. A vessel of refractory material, used to contain ores and metals for assaying or smelting.

CRUSHER. A rock-crusher.

CRYSTALLIZED. Having plainly defined crystals.

CRYSTALS. Geometrical forms, with plane faces, of infinite variety, assumed by the majority of minerals.

CUPOLA. A furnace in a smelter.

CUPRIFEROUS. Copper-bearing.

CUTTING DOWN. When a shaft is enlarged, work begins at the top, and the work of enlargement is called cutting down.

CWT. A hundredweight, of 112 pounds avoirdupois.

DAM. A masonry barrier, built underground, to hold back water.

DATUM LEVEL. The level (usually sea-level or mean level of nearest considerable body of water) from which altitudes are measured in surveys.

DEAD ROASTING. Sulphide ores are dead roasted when all the sulphur possible to drive off by roasting has been eliminated.

DEAD WORK. The opening of new shafts, drifts and winzes, preliminary to the stoping of the mineral bodies.

DEBRIS. Broken down rock material.

DECOMPOSED. Rock or ore broken down by elemental action.

DECREPITATE. To break into fragments with violence, under the blow-pipe or great heat.

DENUATION. The uncovering of rock strata by the weathering of wind or water, or both.

DEPOSIT. A term, loosely used, meaning a mineral body.

DERRICK. A mast, freely rotatable, carrying a boom or yard-arm, at the end of which is a sheave wheel. Used in mining mainly for open pit work.

DESSICATION. The drying out of water for any given substance.

DETRITUS. Debris. Broken down rock.

DEVELOPMENT WORK. Dead work.

DIAMOND DRILL. A machine for boring holes in rocks, taking its name from the black diamonds or bortz used to form cutting edges on the inner and outer edges of the hollow cylindrical bit.

DIE. The iron block in the mortar, on which the ore is fed for crushing under the stamp.

DIORITE. Greenstone. A crystalline spathic hornblende.

DIP. The angle at which a lode or vein descends from the earth's surface.

DIP COMPASS. A compass having the needle fixed to swing in a vertical plane.

DIRT. Frequently used to describe the ore broken underground.

DISSEMINATED ORE. Ore found scattered through a gangue of valueless rock.

DISTURBED. An ore body is disturbed when lacking defined walls and settled character.

DOLLY. A crude prospecting stamp, set on a spring pole.

DOLOMITE. Magnesian limestone; carbonate of calcium and magnesium.

DONKEY HOIST. A small auxiliary hoisting engine, usually operated underground and actuated by compressed air; or else used for preliminary work at new shafts or exploring pits.

DOWNCAST. A shaft having a downward air current.

DRAFTAGE. An arbitrary allowance claimed by English smelters to cover loss of weight in transport.

DRESSING. Separating ore from gangue rock by hand or machinery.

DRESSING FLOOR. A floor or dirt surface where ore is dressed by cobbing and other hand work.

DRIFT. A horizontal opening in a mine, following the direction of the lode or vein; loose alluvial matter, such as sand, pebbles and boulders.

DRIFT COPPER. Native copper found in alluvium far from its original rock matrix, whence carried by glaciers.

DRIFTING. Opening drifts. Driving.

DRILL. A steel bar for boring in rock, having a single sharp cutting face, or two cutting faces crossed at right angles.

DRILL-CORE. As the bit of a diamond drill is hollow, solid, cylindrical cores of rock are cut by its operation. These are raised to surface and form a valuable permanent record of the strata through which the drill has passed.

DRILL HOLE. A hole bored by a drill.

DRIVING. Drifting.

DROP SHAFT. A shaft, usually of heavy framing, sunk by weight, through sand or similar material.

DRUM. The cylinder of a hoisting engine, around which the cable winds.

DRUSE. A vug.

DUCTILE. That which is capable of being extended in length by tension.

DUCTILITY. The capacity of a metal to elongate, when under pull from the ends, without cracking or breaking.

DUMP. A place for dumping rock taken from a mine. An ore-dump contains good mineral, and a waste-dump the worthless rock hoisted from underground.

DYKE. A fissure in the rock formation, usually transverse, filled with igneous matter. When mineralized, dykes are called cross or counter veins.

DYNAMITE. Nitro-glycerine absorbed by wood pulp, infusorial earth, or some similar article to render it safer in use.

EISENER HUT. German for Iron Hat or Gossan.

ELECTRIC DRILL. A power drill operated by an electric current.

ELECTROLYTE. The solution in which electrolytic separation of metals is carried on.

ELECTROLYSIS. The separation and redeposition of metals by electrolytic action.

ELECTROLYTIC. Term applied to copper means copper gained from impure metal by electrical decomposition and redeposition, whereby the copper is taken from an impure bar and redeposited in a pure form at the opposite pole of the battery, while other metals are precipitated to the bottom of the tank in which this work is done.

ELVAN. Cornish name for the dyke rocks of Cornwall, usually greenstone or porphyry.

EROSION. The wearing away of surface masses of rock and soil by the elements and by glacial action.

ERUPTIVE. Rock matter supposed to have been deposited in molten form by volcanic action.

ESCARPMENT. A rock wall, nearly or quite vertical.

EXFOLIATION. The separation of thin leaf-like layers from the main body.

EXPLODERS. Fulminating caps.

FACE. The breast of a drift. A face of ore is the ore shown at the working end of a drift or stope.

FAHLBAND. A banded crystalline rock, carrying finely disseminated sulphide ores.

FALL OF GROUND. Rock falling from the roof into a mine opening.

FALSE SET. A temporary set of timber.

FAN. A device used to force air into a mine.

FATHOM. Six feet. In stoping, a fathom is a cube of six feet.

FAULT. Dislocation of a rock stratum by which continuity is lost.

FEE. The ownership of land in fee-simple.

FEE-OWNER. The owner of land in fee-simple.

FEEDER. A branch ore vein.

FERRUGINOUS. Carrying iron.

FILLING. Allowing a mine to fill with water. Occupying old stopes or chambers with waste rock.

FINES. The finer ores or metals saved in concentrating processes.

FINISHER JIGS. The jigs used to save the fine ores or metals in a concentrator or stampmill.

FIRE. The miner's warning cry when a blast is to be set off, is "fire."

FISSILE. That which may be easily split.

FISSURE. Rock matter foreign in nature to the walls on either side—evidently deposited at a later date geologically, in a crack in the original rock.

FISSURE VEIN. A fissure, containing ore, usually disseminated in a worthless gangue differing in nature from the country rock in which the fissure occurs.

FLAKE COPPER. Very fine scales of native copper.

FLEET-GEAR. A compensating device for taking up slack and paying out rope where a hoisting system is worked in counterbalance. Several turns of the cable are taken around each drum of the hoist, and the bight of the cable is carried to the rear and around a large sheave-wheel lying horizontally and traveling on trunnions, allowing the taking up or paying out of the cable.

FLOAT COPPER. Drift copper.

FLOOR. The floor of a drift or other horizontal mine opening; the underlying rock stratum.

FLOUR COPPER. Very fine native copper that floats on water and is very difficult to save in milling.

FLUCCAN. A seam of clay, found in ore bodies, or, more frequently, between the ore and walls of country rock.

FLUKAN. Fluccan.

FLUME. A launder or pipe line for carrying water.

FLUX. Any mineral or ore used in the furnace to aid in fusing the gangue rock and worthless elements, which combine with the flux to form slag.

FOLIATED. Having a laminated structure.

FOOT. The foot-wall.

FOOT-WALL. The foot. The stratum of rock underlying an inclined mineral lode or vein.

FORKING. Pumping water from a mine.

FORMATION. A term used to imply the general geological conditions of a given district.

FOSSICKING. Extracting metal or ore from old mines or waste burrows.

FRACTURE. A break.

FREE. A metal is free when virgin or native, and not combined chemically with any other element.

FREE-MILLING. A metal or ore that is readily separated from its accompanying rock by mechanical means.

FRIABLE. Easily crushed to a powder.

FURNACE. An oven for the smelting of ore.

FUSE. A cotton cord with a gunpowder core, so made as to carry fire to an explosive placed for use.

FUSIBLE. That which can be melted.

FUSION. Melting. Alloying metals while liquid, through heat.

GABBRO. A rock composed mainly of plagioclase feldspar.

GAD. A small wedge or chisel.

GALLERY. A drift.

GANGUE. The particles of foreign rock matter adhering to disseminated ores or native metal; the gangue rock is mechanically and not chemically united with the ore or metal.

GASH VEIN. A shallow fissure vein, usually wide at surface and rapidly narrowing to extinction.

GEODE. A hollow nodule of rock.

GEOLOGY. The science of the earth.

GIANT POWDER. Dynamite.

GLACIATION. The erosive effect produced by glaciers.

GLANCE. Any metallic sulphide showing a bright, shining surface.

G. M. B. "Good Merchantable Brands"—an English grade of refined copper.

GNEISS. A banded, slaty granite.

GOB. Mud above a mine. Refuse in worked-out openings.

GOPHERING. Prospecting work confined to digging shallow pits or starting adits. Term used from similarity of this work to the crooked little holes dug in the soil by gophers.

GOSSAN. Iron Hat. A rock capping, usually quartzose, showing reddish-brown iron stains, from decomposed iron pyrites. Frequently found overlying sulphide ores of copper.

GRADE. The percentage or value, when applied to ore bodies and partly refined metals.

GRANITE. A dense, granular rock, composed of varying aggregates of quartz, feldspar and mica.

GRANULATED. In the form of grains.

GRASS ROOTS. At surface.

GRAVITY STAMP. A stamp, usually set in batteries of five, in which the piston is raised by a cam, the stamp crushing the charge in the mortar by its weight when allowed to fall.

GREENSTONE. Diorite, or gabbro.

GRIZZLY. A grating of heavy iron or steel bars, through which the smaller pieces of rock or ore fall.

GROSS TON. A long ton of 2,240 pounds avoirdupois.

GROUND SILL. The bed-piece of a set of mine timbers.

GUIDES. Perpendicular wooden stringers for guiding cages in vertical shafts.

GUT. To rob.

HADE. (American). Dip of a vein from the zenith. (English). Dip of a vein from the horizon. Take your choice.

HALVAN. Cornish for refuse copper ore.

HANGING. The hanging-wall; the stratum of rock overlying an inclined mineral lode or vein.

HARDHEAD. A lump of partly smelted ore, carrying high percentages of refractory elements, such as iron, antimony and arsenic.

HAT. The capping of a mineral body.

HAULAGE PLANT. A mechanical installation for the underground tramming of rock, operated by ropes, compressed air or electricity.

HEAD. Water pressure.

HEADGEAR. A building, or framework, fitted with sheaves, over the mouth of a shaft.

HEAP-ROASTING. Burning the sulphur out of ores piled in heaps with a small amount of wood or other fuel.

HEAVE. A fault. The rolling out of line of dip by a lode in making depth.

HEAVING. Rolling.

HECTARE. A metric measure equalling 2.471 acres.

HOIST. An engine for hoisting, the rope, as raised, being coiled around a drum.

HOISTER. A hoist.

HOLE. Any opening in the ground. More especially a hole drilled for explosives.

HOLING THROUGH. A drift or other mine opening is holed through when a connection is made between two separate ends working toward each other.

HORIZON. The sky-line, commonly used in the sense of absolutely flat, as shown by a spirit level. Geologically, all rock strata of the same geological period.

HORSE. An intrusion of country rock into a mineral body. Sometimes synonymous with dyke.

HORSE-WHIM. A windlass operated by horse-power.

HUEL. Cornish for mine. Commonly spelled wheel.

HUNGRY. Nearly or quite barren of mineral value.

HUNTINGTON MILL. An improved Chilean mill.

HYDRATED. Containing water of crystallization.

HYDRO-METALLURGY. The reduction of ores by wet processes.

HYDROUS. Containing water.

IGNEOUS. Rocks of volcanic origin.

IMPREGNATED. Containing ore. Properly used in referring to country rock carrying mineral similar to that in the vein.

IN PLACE. Rock matter in the position where deposited by nature.

IN SITU. In place.

INCH. See Miner's Inch.

INCLINATION. The dip of a vein from the horizon measured in degrees.

INCLINE SHAFT. A shaft sunk at any angle with the horizon under 90°.

INCRUSTATION. A solidified coating, usually crystallized.

INFILTRATION. The deposition of mineral matter from percolating water.

INGOT. A mass of metal cast in a peculiarly formed mold; applied only to gold, silver or copper. Iron is cast in pigs.

INTAKE. The opening for water to enter a pipe or flume.

IRIDESCENT. Showing the colors of the rainbow.

IRON HAT. Gossan.

JIG. A machine for concentrating ore or mineral by means of oscillatory

or vibratory motion, aided by jets of water, separation of the ore from its gangue being effected by the greater specific gravity of the former.

JIGGER. A crude jig.

JIGGING. Concentrating ore by the use of a jig.

JUMPER. A churn drill.

JUNCTION. The uniting point.

KEWEENAWAN. Pertaining to or of the Keweenaw formation, in which the Lake Superior copper mines are opened.

KIBBLE. A bucket used for hoisting material in a shaft.

KILLAS. Clay slate or shale.

KILOGRAM. A metric weight of 2.2046 pounds.

KILOMETER. A measure of distance equalling 0.621376 miles.

KINDLY. Appearance of rock carrying or promising to carry good mineral values.

LADDER ROAD. A ladderway.

LADDERWAY. The series of ladders giving ingress and egress to a mine shaft; the compartment in which the ladders are.

LAGGING. Timber, usually of small diameter, placed over the cap-timbers of incline shafts and drifts, to prevent damage from falling rock.

LAMINAE. Thin plates.

LANDER. The man at the mouth of the shaft, who receives signals from below, and attends to the unloading of rock sent up in buckets, skips or cages.

LAUNDER. A wooden flume or sluice, used to convey water, or tailings held in solution in water.

LAVA. Rock formed by flows from volcanoes.

LEACH. To dissolve minerals from ore by water.

LEACHING. Lixiviating ores.

LEAD (lead). A mineral body.

LEDGE. The solid rock where encountered at or nearest surface.

LEG-PIECE. An upright timber supporting the cap of a timber set.

LEGS. The side pieces of a set of timber.

LENSE. An ore body of lenticular form.

LENTICULAR. Having the shape of a double convex lense.

LEVEL. A horizontal opening in a mine. Levels are commonly opened at stated intervals as depth is gained—usually at 100 feet in modern mining practice. The word "level" is frequently used interchangeably with the word drift, but is more comprehensive. Both drifts and crosscuts may be opened on a level, but a crosscut is not a level.

LIGNEOUS. Of a woody nature.

LIMESTONE. Calcium carbonate.

LIXIVIATION. The process of leaching out mineral values from ores.

LODE. A stratified rock bed carrying mineral values.

LONG TON. A gross ton of 2,240 pounds avordupois.

MAGMA. Gangue. Rock material carrying ores.

MALLEABLE. Capable of changing form, without breaking, under a hammer.

MAN-CAR. A skip-truck having tiers of circus seats, used for carrying miners to and from work in mines operating inclined shafts.

MAN-ENGINE. An appliance for raising and lowering miners in deep inclined shafts. Consists essentially of two long beams, worked in counter-balance and having platforms at stated intervals.

MASS. A solid chunk of native metal.

MASSIVE. Rock without defined lines of cleavage.

MATRICE. The rock surrounding an imbedded object, such as a nugget or mass of native copper.

MATRIX. Matrice.

MATTE. Regulus. A product between copper ore and blister copper, varying greatly in the percentage of metal contained. Is obtained by roasting out more or less sulphur from sulphide copper ores.

MATTING. The process of converting sulphide ores into matte.

MESA. Spanish for a tableland or plateau.

MESH. The size of openings in a screen.

METALLIFEROUS. Carrying metal.

METALLURGY. Science and practice of reducing metals from ores and minerals.

METAMORPHIC. When said of minerals refers to a rock that has undergone structural and chemical changes after its original formation.

METRE. A linear measure equalling 39.37 inches.

METRIC TON. A weight of 2204.6 pounds avordupois.

MILLING. Dressing ore in a mill; also running ore in a mine through a winze for loading into tram-cars or wheelbarrows on a lower level than the one where broken.

MILL RUN. A test of the mineral contents of rock or ore by actual milling.

MINE. An open pit, or underground opening or openings from which mineral values are extracted.

MINER. In strict construction, the man that does the drilling and blasting in a mine. In a broader sense, all men working underground.

MINERAL. Ore, or rock containing metal. In the Lake Superior district the term mineral has a special use, being employed to designate the native copper, with its adhering gangue of amygdaloid or conglomerate rock, as it comes from the mill, before sending to the smelter.

MINERAL BELT. The mineralized territory in a given formation or district.

MINERAL DE COBRE. Copper matte.

MINERALOGY. The science of minerals.

MINERAL RIGHTS. The ownership of the rights to mine under the surface of land. Mineral rights are sometimes reserved in selling the surface of land, in some districts.

MINER'S INCH. The amount of water that will flow through an open-

ing one inch square under a six-inch head, which is 2,274 cubic feet in 24 hours, or 94 $\frac{3}{4}$ cubic feet per hour, equal to 665 wine gallons, or 593 imperial gallons hourly.

MISSED HOLE. A drill hole, charged with explosives which fail to be set off by the fulminating cap.

MOIL. A steel bar, like a drill, except that it is sharpened to a point instead of having a cutting face.

MOLDS. Copper cast in molds.

MORAINE. A mass of boulders and detrital material marking the limits of a former glacier.

MORTAR. An assayer's mortar in which rock or ore is crushed with a pestle; a mortar box.

MORTAR BOX. The iron box under the stamps, into which ore or rock is fed for crushing.

MUCKER. A trammer.

MUNDIC. Pyrite; sulphide of iron.

NATIVE. A virgin metal—not an ore.

NON-CONFORMABLE. Rock strata evidently not originally associated in the position now occupied.

NUGGET. A lump of native metal. Term usually applied to gold.

OPEN-CAST. Working a mine as a quarry, without underground openings.

OPEN CUT. A mine worked open-cast.

ORE. A chemical union of one or more metallic elements with other elements, usually non-metallic, of which oxygen, carbon and sulphur are the most frequent. For the various ores of copper, see chapter on chemistry and mineralogy.

ORE CAR. A mine car for carrying ore or waste rock.

ORE DUMP. See Dump.

ORTHOCLOSE. Silicate of potassium and aluminum. An acid feldspar.

OUTCROP. The ledge of a lode or vein that is exposed on the surface of the earth.

OUTLIER. An isolated rock or group of rocks lying at a distance from the main body, and separated therefrom, on the surface of the earth, by a different rock formation.

OUTPUT. Production.

OVERBURDEN. Superincumbent material, usually drift or alluvium.

OVERHAND STOPING. Removing ore in ascending steps.

OXIDATION. Process of conversion of metals or ores into oxides by weathering.

OXIDE. An ore of any metal or metals chemically united with oxygen.

OXIDIZED. United with oxygen. Many minerals and most metals oxidize with greater or less rapidity when exposed to air or water.

PARE. Cornish for a gang or shift of miners.

PARTING. The separation of two or more metals mechanically ad-

mixed, by electrolysis, cupellation, use of acids or other chemical or metallurgical processes.

PASS. A winze.

PATENTED. A mining claim is patented when the government executes a deed or patent to the holder.

PENTHOUSE. A shed-roof erected in the bottom of a shaft, when sinking, to protect miners from accidental fall of rock, timber or tools from above.

PENTICE. An erroneous spelling of penthouse.

PEROXIDE. The oxide of any metal containing the greatest proportion of oxygen.

PERPENDICULAR SHAFT. A shaft sunk vertically.

PERTENENCIA. One mineral claim in Mexico; area, one hectare, or 2,471 acres.

PETERING. Pinching.

PETER OUT. To pinch out.

PETROGRAPHY. The science of rocks.

PHOSPHATE. An ore of any metal or metals with which phosphorous and oxygen are chemically united.

PICK. A pick ax.

PICUL. A Chinese weight of $133\frac{1}{2}$ pounds.

PILLAR. A section of rock or ore left in place to support shafts or roofs.

PINCHING. The narrowing of a vein.

PINCHING OUT. The narrowing of a vein to extinction.

PIT. An opening in the earth's surface, usually shallow.

PITCH. Synonymous with "dip," but occasionally used to designate the angle of decline from the horizon measured along the strike of the lode or vein.

PITCHING. The irregular descent of a vein.

PLAIN. A flat, champaign country.

PLANT. The machinery equipment of a mine or reduction works. In general use the term includes buildings housing machinery.

PLAT. The enlargement of a shaft at a level, to give extra space for loading and unloading the cage, skip or bucket.

PLATEAU. A flat table land, similar to a prairie, but at a higher elevation.

PLUTONIAN. Volcanic.

PLUTONIC. Rock strata of volcanic origin overlaid at some time by later beds.

POCKET. Underground, an ore deposit, usually of small extent. On surface, a bin at shaft house or mill, in which ore is stored.

POCKETY. Where a mineral body carries values very irregularly, in spots, it is said to be pockety.

POLL-PICK. A tool having a pick on one end, and a poll, or hammer head, on the other.

POOD. A Russian weight of 36.112 pounds avordupois.

POPPET-HEAD. Framework over a shaft for a sheave-wheel.

POWER-DRILL. A machine for drilling holes in rock, actuated by compressed air, steam or electricity.

PRILL. Cornish for selected ore secured by cobbing.

PRIMARY. The oldest rock formations.

PROP. A heavy timber placed with its foot against the floor of a mine opening and its top against the roof, to support the rock above.

PROSPECT. To seek for mineral; a new mining property that has not yet earned the right to be called a mine.

PROSPECTING. Exploratory work for mineral, on property where no regular mine has been opened.

PROSPECTOR. A searcher for mineral.

PROTOXIDE. The oxide of any metal containing the least proportion of oxygen.

PUDDINGSTONE. A coarse conglomerate showing rounded pebbles.

PULLEY-STAND. A temporary tripod or other light frame construction, holding a pulley, over which the rope used in hoisting is passed.

PULP. Wet, concentrated ores.

PULVERIZE. To crush to a powder.

PYRRHOTITE. Magnetic iron sulphide.

PYRITE. Iron disulphide.

PYRITES. Sulphide ores; pyrite.

PYROGNOSTICS. Characteristics of a mineral under the blowpipe.

QUARRY. An open pit, of varying size, sometimes several acres in area, from which stone or ore is mined.

QUARTER-SECTION. A quarter of a square mile of land; 160 acres laid out in a parallelogram, each side of which is one half mile in length.

QUARTZ. Silica. Dioxide of silicon, frequently containing traces of iron and other minerals, and often the gangue of gold and other metals.

QUARTZITE. An oxide of silicon, with other minerals in varying quantities, partly granular and partly crystalline in structure.

QUARTZOSE. Rock having much quartz in its composition.

RAGGING. Cornish for rough cobbing; middle sized broken lumps of ore.

RAISE. A shaft or winze that is being opened from below. Sometimes called upraise or uprise.

RANGE. A mineral belt, also in many American states a surveyor's term for describing and locating lands. The state is surveyed in sections (with their subdivisions), towns and ranges. A town (or township) comprises 36 sections and is a square of six miles. Each township receives a double number, one for the town and one for the range. The towns are numbered consecutively from south to north and the ranges are similarly numbered from east to west.

RAW ORE. Ore before treatment.

REAMER. A tool like a bit, used to enlarge a hole previously drilled.

REDUCTION. The separation of metals from their ores.

REEF. A stratified mineral-bearing rock formation.

REFINING. The elimination of impurities from crude metals, or separation of metallic alloys obtained in the reduction of ores.

REFRACTORY. A refractory ore is one that cannot be smelted by ordinary metallurgical processes. A refractory stamp-rock is one that is pulverized with unusual difficulty.

REGULUS. Copper matte.

RESERVES. Bodies of mineral-bearing ground opened in a mine ahead of immediate requirements.

REVERBERATORY FURNACE. A smelting furnace in which the flame from the grate is reflected back on the charge of ore by the roof.

RISE. A raise.

ROASTING. Driving off sulphur and other similar volatile elements from ore by heating. When done in a furnace under great heat, the process is called calcining.

ROASTING FURNACE. An oven for the expulsion of sulphur, arsenic and other volatile elements from ore.

ROB. A mine is robbed when its pillars and other supports are removed for their mineral values, regardless of the future of the property. Done only by unprincipled persons or when the mine is about to be abandoned.

ROCK. Stone.

ROCK BURROW. A pile of refuse rock from a mine.

ROCK CAR. An ore car.

ROCK-CRUSHER. A machine for reducing rock or ore to smaller sizes. Crushers are of two types, the jaw-crusher and the centrifugal. The jaw-crusher works as a man cracks nuts with his teeth, the centrifugal operates on the plan of a coffee-grinder.

ROCK-DUMP. The place where worthless rock is piled.

ROCK-FILLING. Waste rock placed in worked-out stopes as a support for the roof.

ROCK-HOUSE. A building where copper-bearing rock is received and put through crushers before shipment to the mill. Is really a preparatory mill. Is usually built in connection with a shaft house.

ROLLING. In its descent, a lode or vein, while fairly constant to a given angle on the average, frequently makes depth at irregular angles. This is called rolling.

ROLLS. Heavy steel rollers, worked in pairs like a clothes-wringer, used for crushing rock and ore.

ROOF. The rock above a mine opening.

ROOM. Similar to a stope; term usually applied to mines working mineral bodies lying nearly horizontally.

ROYALTY. A percentage paid to the fee-owner from mineral values obtained by the lessee of a mine.

RULE-OF-THUMB. The guess-work and rough measurement plan of mining, in contradistinction to systematic development from data obtained by careful surveying and engineering.

RUN. When superincumbent material is coming into mine openings, the ground is said to be running.

SADDLE. An anticlinal.

SAFETY CAGE. A cage furnished with automatic appliances to stop its descent in case the cable breaks. Usually works well in theory.

SALT. A chemical union of an acid with a base.

SALTING. Placing foreign ore in a mine to deceive intending purchasers or other interested parties.

SAMPLE. A specimen of ore—usually not the worst to be found in the mine.

SAND PUMP. A pump, usually centrifugal, designed to lift water carrying large quantities of coarse tailings.

SANDS. Tailings from the stamp mills of Lake Superior copper mines.

SAND SHAFT. A shaft sunk through sand.

SAND WHEEL. A large wheel, having buckets on its inner perimeter, for elevating water carrying stamp sand.

SCALE COPPER. Copper in very thin flakes.

SCHIST. A metamorphic slaty rock of foliated structure.

SCHISTOSE. Approximating to schist.

SCORIA. The slaty, porous portion of a lava flow; slags from copper smelters.

SCRAM. A mine that is being gone through carefully, when apparently worked out, for mineral previously overlooked; to scam.

SCRAMMING. Searching a mine for mineral previously overlooked.

SCREEN. A grating of perforated metal or woven wire.

SEAM. A thin layer of rock or ore.

SECONDARY. Rock strata of the second period.

SECTILE. That which may be cut easily.

SECTION. A field or district; also, in the United States of America, a square mile of land.

SECTION POST. A boundary mark set at section corners by surveyors.

SEDIMENTARY. Rocks formed by deposition from water, as contradistinguished from rocks formed by igneous action.

SELVEGE. Fluccan.

SET. A framed set of timber used for supporting ground in a mine.

SHAFT. A downward opening into a mine, with its upper end at surface.

SHAFT-HOUSE. A building at the mouth of a shaft, where ore or rock is landed from below.

SHALE. An argillaceous slate, of fissile structure.

SHEAVE. A grooved wheel, notched to carry rope. An open pulley.

SHIFT. A miner's turn, of eight to ten hours' work; a force of men employed on one turn.

SHIFT-BOSS. A mine boss or under captain in charge of one gang or party of miners.

SHOE. A stampshoe.

SHOOT. A chute.

SHORT TON. A weight of 2,000 pounds avordupois.

SHOT. A blast of some explosive.

SHOT COPPER. Small rounded nodules of native copper, somewhat resembling small shot in size and shape.

SHUTE. A chute.

SILICA. Dioxide of silicon; quartz.

SILICATE. An ore of any metal or metals chemically united with silica.

SILL. The floor-piece of a set of mine timber.

SINKING. The process of deepening a shaft or winze.

SINKING-PUMP. A pump, usually vertical, secured to a platform, and lowered as required, as the shafts are deepened.

SKIP. An iron box, open at the top, running on four wheels, and hauled by a cable, used in incline shafts for hoisting ore and rock and lowering timber.

SKIP-ROAD. A track of T-rails spiked to wooden sleepers, on which the skip runs.

SKIP-WAY. A skip-road.

SLAG. The vitreous refuse matter from a smelting-furnace.

SLICING. When mine pillars are removed the work is called slicing down.

SLICKENSIDES. A polished rock surface showing striations produced by movement of adjoining rocks under great pressure.

SLIDE. A dissociation of strata caused by the subsidence of the overlying rock formation.

SLIMES. Exceedingly small particles of rock and mineral held in solution in water, making a slimy mixture.

SLIME TABLE. A circular revolving table whereon slimes are worked, and the minute particles of mineral saved.

SLIP. A fault where a superincumbent stratum has slid downwards.

SLUDGE. Mixed rock and water, brought to surface where a diamond drill cuts through very soft rock: also, the tailings from a concentrator or mill.

SLUICE. A wooden flume or launder.

SMELTER. Works where ores or crude metals are freed from gangue or chemically united elements by heat.

SMELTING. The reduction of ores and crude metals in furnaces by heat, fuel and fluxing material being added to the material to be smelted.

SMELTS. A smelting plant.

SOAPSTONE. Steatite.

SOLLAR. A platform in a shaft.

SPATHIC. Having a form approximating that of feldspar.

SPILL. Lagging driven ahead of the regular timbering in treacherous ground.

SPITZKASTEN. German for a pyramidal box, wherein ores are concentrated and sized by a jet of water fed from below.

SPOON. A long-handled spoon used to scrape out drill holes.

SQUARE SETS. A form of mine timbering with mortised and tenoned sill, top piece and uprights of equal length, joined at right angles.

SQUIB. A fuse.

STACK. The chimney of a furnace; usually employed to designate a number of furnaces, when used in the plural.

STAMP-MILL. A mill for crushing and concentrating minerals.

STAMP-ROCK. Rock containing fine copper that can be secured by stamping.

STAMPS. Machines to crush rock or ore by heavy blows.

STAMP-SHOE. The heavy chilled iron casting attached to the lower end of a stamp piston that does the actual crushing of rock in a stamp mill.

STATION. A chamber in a shaft, cut out for pumps, etc.

STEAM-HAMMER. A heavy hammer actuated by steam or compressed air.

STREAM-STAMP. A stamp actuated by steam.

STRATITE. Soapstone. A greasy mineral, having a talc base.

STEP FAULT. A series of faults, rising like steps.

STOCKWERK. Country rock penetrated by numerous small stringers of ore, the entire mass averaging sufficiently rich to permit its mining and treatment.

STOPE. Used interchangeably to designate the excavation above a drift, or the pay rock remaining unmined above a drift.

STOPING. Breaking down the mass of pay rock or ore above a drift. When stoping in an ore body of average width, miners can break rock much more quickly and cheaply than when driving the drifts, which are usually about 7x7 feet in size.

STOPING GROUND. Ground in reserve, opened by drifts, and ready for breaking down.

STRATA. The successive rock layers of the earth.

STRATIFIED. Having regular layers of varying rock formation.

STRATUM. A layer or bed of rock.

STREAK. The color given by a mineral when scratched.

STRIKE. The horizontal trend of a mineral body, measured by the points of the compass.

STRINGER. A thin seam of ore.

STRIPPING. (v). Uncovering a lode, vein or bed of mineral, by removing the superincumbent earth; (n). the drift or alluvial soil overlying an ore body.

STRUCTURE. The form of a mineral, such as granular, crystalline or amorphous.

STUDDLE. A prop in a mine.

STULL. The top piece of a set of mine timber.

SULPHATE. An ore of any metal or metals with which sulphur and water are chemically united.

SULPHIDE. An ore of any metal or metals with which sulphur is chemically united. Sometimes called a sulphuret.

SULPHOANTIMONIDE. An ore of any metal or metals with which sulphur and antimony are chemically united.

SULPHOARSENIDE. An ore of any metal or metals with which sulphur and arsenic are chemically united.

SULPHURET. A sulphide. Term becoming obsolete.

SUMP. The bottom of a shaft, where water collects.

SURFACE CAPTAIN. A mine superintendent whose duties are wholly on surface.

SURFACE RIGHTS. The ownership of the surface of land only, where mineral rights are reserved.

SWABSTICK. A stick used to clean out drill-holes.

SYNCLINAL. A trough formed by rock strata that are low in the center and high on the sides. Reverse of an anticlinal.

TABLE. An ore concentrator, of which there are various forms.

TAILINGS. Refuse matter from a stamp mill.

TAMPING. Closely packing clay or other sticky earth into a drill-hole above the cartridges, to give greater force to the blast.

TAPER OFF. Cornish for stopping work temporarily.

TELERA. Spanish for a roast-heap of sulphide ore.

TENSILE STRENGTH. The resistance to breaking or elongation offered by metal when under strain from either end.

TERRERO. Spanish for waste burrows.

TERTIARY. Rocks of comparatively recent formation, as time is measured by geological periods.

TEST-PIT. A shallow pit sunk to discover mineral.

THROW. The vertical displacement of a vein caused by faulting.

TIMBER. The wooden beams and sticks used for underground supports.

TIMBER-BOSS. The head timberman.

TIMBERMAN. One who works at timbering a mine.

TON. See Metric, Long and Short tons.

TONELADA. Spanish for ton.

TOSSING. Jigging finely comminuted ore.

TOWN. See Range for description.

TRACHYTE. A micaceous hornblende and feldspar rock.

TRAM. To load rock or ore in tram-cars and push same to the shaft; a tramway.

TRAM-CAR. A car running underground on light T-rails, used for carrying rock from the stopes and other workings to the shafts.

TRAMMERS. Men who load and tram the broken rock underground.

TRAP. A dense gray, blue or greenish rock of volcanic origin; of considerable variety in different beds, but usually of feldspathic-augitic nature.

TRAPPEAN. Pertaining to trap rock.

TREND. The general direction of a mineral body.

TRESTLE. A frame-work of timbers, connecting various mine and mill buildings on surface, usually carrying tram-tracks.

TRIBUTE. The royalty or percentage paid by workmen to owners for the privilege of working a mine. Apt to be a form of grand larceny, at the expense of the mine's future.

TRIBUTOR. One who works a mine on tribute.

TRIPOD. The three-legged iron frame on which the working parts of a power-drill rest.

TROLLEY-CABLE. A wire rope sometimes used in an incline shaft as a guide for the bucket.

TROUBLED. A vein is troubled when disturbed or faulted.

TSUBO. Japanese measure of six feet square, equalling 36 square feet.

TUFA. (Calcareous). A porous limestone; (volcanic). Loosely cemented ash and scoria from a volcano.

TURBINE. The most efficient form of water-wheel.

TUTWORK. Development work.

UNCONFORMABLE. Rock strata that do not correspond as to bedding, horizons or geological age.

UNDERHAND STOPING. Removing ore in descending steps.

UNDERLAY. The mineral bodies lying under a given tract, though not outcropping on surface.

UNPATENTED. Mining claims held from the United States Government subject to annual assessment work.

UNSTRATIFIED. Rock forms not bedded in layers.

UNWATER. To free from water; to pump out.

UPCAST. A shaft having an upward air current.

UPRAISE. A raise.

VAN. To dress ore.

VANNER. A jig for dressing ore by means of vibratory motion, aided by jets of water to carry away gangue-rock.

VARA. A Spanish-American measure of 33 inches.

VEIN. A mineral body having defined walls. See contact vein and fissure vein.

VEINSTUFF. Ore with its associated gangue.

VENTILATION. The system of natural or artificial air currents in a mine. See air-shaft.

VERTICAL. Perpendicular. Upright and downright.

VERTICAL SHAFT. One sunk at an angle of 90° with the horizon, or directly downwards toward the center of the earth.

VINNEY. Cornish for copper ore with a green coating caused by weathering.

VIRGIN. Native metal, as distinguished from ores, which are chemical compounds.

VITREOUS. Of a glassy nature.

VOLATILE. That which can be driven off as vapor, by heat.

VUG. A druse. A hollow, or cave, entirely surrounded by rock. Usually shows fine crystallizations.

WALL. Rock of a different formation adjoining a vein or other ore body.

WATER DRILL. A power drill in which a current of water runs through the bit of the drill, changing the rock dust from the bit into sludge which is expelled from the bore-hole by the force of the current.

WATER JACKETED FURNACE. A smelting furnace provided with an outer jacket, between which and the furnace proper water is circulated.

WATER LEVEL. The point above which water does not rise when a mine is allowed to fill.

WEATHERED. Rock altered in structure by exposure to air and water.

WET PROCESSES. Leaching processes; lixiviation.

WHEAL. Cornish for mine. Synonymous with *bal*.

WHIM. A windlass with a horizontal drum.

WHIP. A rope and fixed pulley or pulleys, for hoisting.

WILFLEY. A Wilfley concentrating table.

WINCH. A windlass.

WINDLASS. A winding device for hoisting from a pit or shaft, by means of coiling a rope or cable around a drum.

WIRE BARS. Refined copper cast into bars for wire drawing.

WORKINGS. The underground openings of a mine.

YELLOW COPPER ORE. Chalcopyrite.

ZINC BLENDE. Sphalerite. Sulphide of zinc.

CHAPTER VII.

COPPER DEPOSITS OF THE UNITED STATES.

In this chapter will be found synopses of the principal features of interest, scientifically and commercially, of the copper deposits of the United States, arranged by states and territories, in alphabetical order.

ALABAMA. This state possesses deposits of chalcopyrite ore occurring as veins in igneous rocks, in Cleburne and Randolph counties. The upper portions of at least two of these veins carried good values in oxide and carbonate ores, with some associated gold and silver values, and occasional sheets of native copper. Two mines were worked quite extensively in the seventies. These were closed when the altered ores were replaced at depth by sulphides. There has recently been some revival of interest in Alabama copper ores, which, so far as known, are confined to the northwestern corner of the state, and some development work is now under way.

ALASKA. In giving consideration to the mineral deposits of Alaska, it must be borne in mind that this territory is an empire in itself, having a greater area than France and Germany combined. The copper deposits, known and partially prospected, are scattered over a vast territory, and occur under such varying geological and geographical conditions that comments pertinent to one district might be entirely inapplicable to another. Alaskan copper deposits cannot be considered as one district, but as a number of separate fields, with all the distinctions implied thereby.

It may be said, in a general way, that there is much copper in Alaska. It may also be said that there are many and able liars in Alaska. There is little question that the various placer gold camps of interior Alaska and the Yukon have been systematically boomed by an organized clique, to the benefit of sundry transportation lines and outfitting firms. Many of the press despatches have been of a misleading nature, and there are evidences that similar systematic promotion of a copper mining boom is being attempted. This is not intended to apply to the local newspapers of Alaska, but to certain not always veracious correspondents, and to various newspapers along the Pacific coast. This criticism will doubtless bring forth warm expostulations, and perhaps the author will be accused of attempting to deliberately injure a new and promising copper field, though such is not the case. There is every likelihood that good copper mines will be opened in Alaska. In fact, several now opening are of more than ordinary promise, but there has been so much of exaggeration, of misrepresentation and of downright lying, about Alaskan copper deposits, that the reported finds of mountains of pure copper must be taken *cum grano salis*. The bogus mine

promoter always finds his most profitable field in a district far from centers of population and difficult of access. Ten years ago Arizona was filled with wildcat mines and mining fakery of all grades, and they gave that territory a very bad reputation among investors. This bad state of affairs has been greatly ameliorated of late, and while there are still salted mines and mine salters in Arizona, the standard of mining and mine promotion has been greatly raised in the past few years, as the district has become more accessible and better known. Alaska is today where Arizona was ten years ago—a *terra incognita*, where all things are possible, and a country of such magnificent distances that the natural-born liar finds opportunities of outdoing his own best records. There are fine copper mines awaiting opening in Alaska, but there are also cleverly made bogus gold bricks awaiting purchasers. The country undoubtedly offers great opportunities to investors with the capital, skill and business sense required for successful mining in any part of the world, but common business prudence dictates careful examination by competent experts before the investment of money. All legitimate mining districts court this sort of investigation.

Copper is reported as occurring at many points in Alaska, prominent among which are the valleys of the Copper, White, Chitna and Tanana rivers; on Latouche and Prince of Wales islands, along the Mt. St. Elias range; at various inland points in the Ketchikan district; on the Scolai range; at Sunrise, and elsewhere. Alaska is a hilly and often mountainous country, except along the tundra of the Arctic circle, and the valleys of the large rivers, often five to thirty miles in width, are the natural highways for prospectors, hence it arises that mineral discoveries are first reported from them, in the interior districts.

The copper fields of the Copper river and its principal tributaries have attracted the widest attention, though the most important developments are along the coast. The Copper river basin, with the valleys of its tributary rivers, is a vast field, and will require many years for even a fairly complete preliminary examination. This basin is a broad synclinalorium, the central part of which is occupied by the Wrangell Mountains, which are of Tertiary age. Copper ores are reported from many points along the valley of the Chitna and between that river and Mt. Wrangell.

The White river is a tributary of the Yukon, with a generally northerly trend. Kletsan creek, a small tributary of the upper White, has excited much interest, because of the occurrence of native copper, which has been gathered and used by the natives for arrow-heads, bullets and ornaments. Scolai Pass is the divide between the head waters of the White and Chitna rivers. Mr. James Lindsay, a well-known consulting engineer of Portland, Ore., spent the spring and summer of 1902 in Alaska, and made a very careful examination of the upper White river copper fields. He informs me that the much-talked-of Kletsan creek is apparently of little importance as a possible future source of copper supply. The native copper occurs in placer form only, and has evidently been derived from ancient basaltic dikes intersecting greenstone diorite and carboniferous limestone. The river valley

for a hundred miles east from Scolai Pass is covered with volcanic ash, which is over 100 feet deep at the international boundary line on the White river. This volcanic ash meets the perpetual snow and ice at an altitude of 6,000 feet on the mountains, and the cupriferous veins are most effectually hidden by the scoria or by the everlasting ice and snow, affording about as discouraging a prospect for exploration as could be found at any point on the globe. The United States Geological Survey reports that the largest placer nuggets of copper in the Kletsan creek valley weigh eight to ten pounds, and that investigation disclosed the original home of the placer copper to be in the greenstones, which were traversed by irregular joints, in which calcite was deposited, and these were found to carry copper, the veins so found being small and of no commercial value. All of the cupriferous veins were in contact with the limestone. In the same neighborhood are trappean amygdaloids carrying amygdules of chalcopyrite.

Discoveries of native copper, bornite and chalcopyrite are reported from the Kotsina river. Near the Kuskulana river a mass of native copper, three feet wide and eight feet long, was found.

On the islands and mainland in the Prince William's Sound district a number of promising properties have been opened, one of the most advanced being on Latouche Island. The Alaska Central railroad is to run from Valdez, at the head of Resurrection Bay, on Prince William's Sound, to Rampart, on the Yukon river, near the Arctic circle and international boundary line. Preliminary surveys have been made and while the exact route of the line is not fully determined at all points, the road will run along the valley of the Copper river from Copper Center to Mentasta Pass, thence northwesterly, crossing the upper Tanana to the Yukon, a distance of approximately 400 miles. This railroad will traverse several promising mineral districts, and its construction seems assured.

At the present time the most important copper district of Alaska is in the vicinity of Ketchikan, in southern Alaska. On Prince of Wales Island several mines are being opened on veins of sulphide ore that are apparently of good width and permanence, and which carry gold and silver as well as fair percentages of copper. This district has the advantage of tide-water, giving cheap and fairly rapid communication with the cities of Puget Sound and the Pacific coast of the United States. It is quite certain that the first regularly producing copper mines of Alaska will be developed here, and some of them should become factors in the world's production during the present year.

ARIZONA. Arizona is the third district of the United States and the fourth in the world in point of productive capacity. No other copper field has shown such marked gains in production during the past decade, and there is every reason to believe that the output will continue to increase for many years to come.

Arizona has nearly a quarter of the copper mines of the United States. Many of them are of very doubtful value; a few are of fully demonstrated worth, and a considerable number give promise of becoming both

large and profitable producers. The mere fact that a copper mine is located in Arizona should not prejudice opinion for or against it. Some of the best and some of the worst mines ever opened are in this territory, and each mine should be judged individually, upon its merits.

There are evidences of rude mining by prehistoric peoples at a number of points in the territory, but no traces of smelting, and had the copper ores been reduced, the slags, and possibly remnants of the furnaces, could hardly have escaped attention in modern days. It seems likely that the iron ochres, malachite and azurite were mined in a crude way, for pigments. Prehistoric turquoise mines have been found at several points, notably in the Dragoon Mountain range.

The first copper made in Arizona was turned out of an adobe furnace at the Longfellow mine, Clifton, in 1873. The nearest railroad point was 800 miles distant at that time. The development of the mineral resources of the territory of Arizona has been a remarkable one, during the three decades that have since elapsed.

The copper zone of Arizona, broadly speaking, has a general southeasterly and northwesterly trend, and the copper deposits, as a rule, are found along the contacts of igneous rocks, such as porphyry and diorite, with limestone of the Paleozoic group, mostly of the carboniferous series. The general geological conditions of Arizona are much the same as in the adjoining Mexican state of Sonora.

Copper ores are found in more or less profusion in every county of the territory. The counties are of princely size, and as the topography ranges from hilly to mountainous in most parts, not even the best known districts have been developed yet, or even fully prospected. Nearly all of the ores of copper are found in Arizona, and native copper is of not uncommon occurrence, especially in the mines at Clifton and Bisbee. The principal copper districts are four in number, as follows: Bisbee, in Cochise county, only six miles from the Mexican border; Jerome, Yavapai county, in the northwestern part of the state; Clifton, including Morenci, in Graham county, north of Bisbee and close to the New Mexican border; Globe, Pinal county, not far from the center of the territory. In addition to these four principal districts, all of which are considerable producers, in about the order given, there are a dozen or more smaller districts, such as the Helvetia, in Pima county; the Wickenburg, and others.

The Bisbee district, of which the town of that name is the center, is really a part, geographically, of the great Sonoran copper belt of Mexico. The ore deposits occur in carboniferous limestones, bedded in nearly horizontal planes, and underlaid by quartzite. The veins are notable for the quantity of fluccan along the walls, and are easily mined as a rule. The clay carries considerable finely comminuted native copper and masses of native metal of respectable size are occasionally encountered. The oxidized zone extends to a depth of perhaps 400 feet and is succeeded by unaltered iron-copper sulphides that average excellent values. The oxidized zone is notable for the richness and extent of its high-grade carbonate ores.

The country rock of the Jerome district is slate, extensively intruded by dioritic igneous rocks, slates and diorites having a capping of uncomformable limestones of later age and devoid of copper. There is a limited zone of oxidized ores, but the principal dependence is placed upon the unaltered disseminated sulphides. These are by no means remarkable for their high percentages of copper, but are notable for their great extent and the high values carried in gold and silver.

The Clifton district has quartzite and limestones superimposed on granite, with intrusive igneous rocks of both basic and acid types, the entire formation being greatly faulted. Ore occurs in both the eruptive rocks and the limestones. It was in this district that the first Arizona copper mining was done, three decades ago. There were very extensive deposits of rich oxidized ores near the surface, along the contacts between the porphyry and magnesian limestone. These ores were self-fluxing and highly profitable but gave out at shallow depth, and, contrary to the usual rule, were not succeeded by sulphides. Extensive openings, on the porphyry of Humboldt Mountain, have developed enormous beds of low-grade sulphides, during the past ten years, and these are now the mainstay of the district, though some carbonate ores are still mined. The leaching process, little used in the United States, is employed to advantage in the treatment of certain of the low-grade ores of this district.

The first mining in the Globe district was done in 1876, and was for silver. The Old Dominion, the principal producer and a typical mine of this field, is opened on a contact vein between a diorite foot and a hanging of carboniferous limestone, over the greater part of which there is a trachyte capping. The principal ore bodies are in the limestone, and the ores are mostly oxidized. A peculiar feature is the presence of a sulphide zone which has oxidized ores both above and below. The ores are highly silicious and require heavy fluxing with iron and lime. The lack of sulphide ores, to furnish the iron needed in fluxing, is one of the most serious drawbacks of this district. It seems likely that ample bodies of unaltered sulphides will be found at some future time, in or adjacent to this district, where operations are further handicapped by very high freight rates on coke and other supplies.

Political expediency should not be allowed to longer prevent the admission of the territory of Arizona into the sisterhood of states. The territory has the population, resources and assured future that are necessary requisites of statehood, and should no longer be kept in leading strings, when both able and willing to conduct its own affairs as an independent commonwealth.

ARKANSAS. Tetrahedrite and tennantite occur in the Kellogg mine, Pulaski county, only ten miles north of Little Rock, the capital of the state. These are not commonly considered as commercial ores of copper, owing to their refractory nature and the highly deleterious effects of both antimony and bismuth upon finished copper, even in small amounts. Antimonial

and bismuthiferous ores are rarely worked, unless carrying considerable values in silver, as is the case at Butte, in Algeria, and at other points.

CALIFORNIA. There are few states in the American union more richly endowed with copper than California. To give the names of all the counties in which copper is mined or found would be nearly equivalent to calling the roster of the state, as there are but few in which ores of the metal are not found in more or less profusion.

It may be said, in a general way, that there are two copper belts in the state, one following the Coast Range mountains, while the other is found in the foothills of the Sierras. Both belts have a north and south trend, and extend through practically the entire state. The Sierran belt reaches from Oregon on the north, through the counties of Lassen, Plumas, Sierra, Nevada, Placer, El Dorado, Amador, Calaveras, Tuolumne, Mariposa, Madera, Fresno, Tulare, Kern, Los Angeles, San Bernardino, and Riverside, to the Lower California line. The Coast Range belt extends from Del Norte to San Diego, across the state from north to south. In Kern county there is an apparent branching of the Sierran copper range, with an offshoot that traverses Inyo and San Bernardino counties, then enters the neighboring territory of Arizona, thus establishing a close geological and geographical connection between the copper measures of Arizona and California.

The Californian copper beds are found in close proximity to the gold-fields, and much of the copper ore carries considerable values in gold. In the northern part of the state the gold and copper veins are apparently interwoven. There are ample evidences of intense volcanic action in this section, and in Shasta and adjoining counties the copper deposits are almost invariably auriferous to a profitable extent.

The first Californian copper mining was done in 1860, at Copperopolis. Considerable ore was shipped to New York, Baltimore and Swansea for reduction, and in 1863-1866 no less than nine small smelters were built in the state, copper production reaching nearly 2,000,000 pounds in 1864. The great fall in price brought operations to a stop in 1867-68, and almost no copper mining was done after that time until 1895, when an English company bought the "worthless" Iron Mountain mine in Shasta county, and in seven years has made it one of the world's great copper producers.

Although there are several other districts of promise, Shasta county is the source of the principal production, and the scene of the greatest activity in the development of new mines. This belt is from half a mile to four miles wide, with an average width of perhaps less than two miles, and a proven length of about twenty miles, though possibly much longer. The belt has a crescent form, with the principal developments at the western end. The country rock is porphyry, with slate to the west and granite and quartzite to the east. The beds occur as mammoth, flat-lying lenses of low-grade auriferous sulphide ores of copper, usually capped by massive beds of gossan. One considerable body of silicious ore has been opened by the Mt. Shasta Gold Mines Corporation.

As a rule the alteration zone of Californian copper deposits is comparatively shallow. While the high-grade oxidized ores are found in large quantities at surface and for a little depth, the unaltered iron-sulphides usually come in at a depth of about one hundred feet, hence the big mines of the state will be, like the Mountain, low-grade mines operated on a very large scale.

Next to Shasta the copper producing counties of California rank in about the following order of importance: Calaveras, Fresno, San Bernardino, Kern, Mariposa, Madera, Merced, Stanislaus, Amador.

Native copper has been found at Napoleon, Calaveras county; at Cosumnes, Amador county, and elsewhere.

COLORADO. With the exception of an extensive plateau in the eastern part of the state, Colorado is heavily mineralized at nearly all points, and while gold and silver have been most extensively exploited, copper, iron and the other minerals exist in abundance in many parts. Copper ores are found in the counties of Boulder, Chaffee, Clear Creek, Custer, Gilpin, Gunnison, Hinsdale, Huerfano, Lake, La Plata, Ouray, Park, Pitkin, Rio Grande, San Juan, San Miguel, and Summit.

The production of refined copper by Colorado mines has run up into the thousands of tons for some years past, but almost without exception this has been secured as a by-product from the smelting of gold, silver and lead ores. The sulphide ores predominate and are found at many points. At present a number of copper mines are being opened, mainly in San Juan county near the New Mexico border, and in the northern part of the state near the Wyoming line.

CONNECTICUT. There are two copper mines in Connecticut, from which ore has been produced occasionally during the past century, these being the Newgate at Granby, and the Bristol in the town of that name, but both are idle at present. Malachite, bornite, chalcocite and chalcopyrite are found at Bristol; cuprite, malachite, chalcocite and bornite are found at Cheshire; chalcopyrite occurs at Middletown, New Britain, Roxbury, Bolton, Brookfield, Sunbury, Litchfield and other points, and native copper is found at Farmington in red sandstone. A 200-pound mass of native copper was found in alluvium near New Haven. Copper ore was also found near Montville in 1902.

DELAWARE. Chalcopyrite has been found in the quarries of the Wilmington Granite Co., on the Brandywine river, near Wilmington, but no workable deposits of copper ore are known to exist in this state.

FLORIDA. No important or workable bodies of copper ore are known to exist in this state, but small veins of sulphide ores have been found at several different points.

GEORGIA. Copper ores exist in the counties of Fannin, Lincoln and Rabun, and probably in other parts of Georgia. Considerable chalcopyrite

is found in Fannin county, at a point only two miles distant from the copper mines of Ducktown, Tennessee. At present there is but one active producer of copper in the state, this being the old Magruder mine, now owned by the Seminole Copper Co., but reopening work is being done at the Canton mine, and a small amount of work is under way at other points.

IDAHO. Although Idaho has never been a large producer of copper, the state possesses important deposits of ore at several points, and a large amount of development work is now under way. Copper ore is found in the counties of Alturas, Brigham, Custer, Idaho, Lemhi, Shoshone and Washington, and possibly elsewhere, as the entire state is richly endowed with metals, and the exploration and development of its mineral wealth has been by no means commensurate with the opportunities. The principal copper developments of the present are in Custer, Washington and Lemhi counties. The ores are mainly carbonates and sulphides, though other forms occur and native copper has been found in the sluice-boxes of the gold mines at Murray.

There was much interest aroused in the Seven Devils district a few years ago, but for some reason that does not seem quite clear, this district with the diabolical name has failed to develop any regular copper producers, though ore of the best grade has been found. Sooner or later there should be some good mines opened in this district.

The principal copper mining operations of the present are carried on in Custer county, by the White Knob company. A vast amount of work has been done at this point, and while the ore is of low grade it is hoped that the mining may prove profitable, by reason of operating on a great scale.

The Coeur d'Alene copper district is receiving some attention at present, and has a number of promising prospects. Although silver-lead mines have been operated for years in this district, it was not until 1898 that any attempt was made at copper mining. At present there is a considerable activity in this field, though none of the copper mines have passed beyond the stage of prospects.

ILLINOIS. Native copper, occurring as drift, in the alluvium, is of rather common occurrence in Illinois, but is, of course, of no commercial importance. The only deposits of copper ore in place known in the state are in Hardin and Chittenden counties. Chalcopyrite has been found in fair quantities near Rosiclare, Hardin county, and during 1902 considerable copper was found, in connection with lead and spar, in Hardin and Chittenden counties, and an attempt was made at organizing a company to open a mine.

KANSAS. The rock strata of Kansas range from carboniferous to tertiary, but the igneous rocks are lacking, and without them there seems slight likelihood of discovering important copper deposits. A little chalcopyrite in tetrahedral crystals has been taken from the lead and zinc mines of Galena, Cherokee county, in the southwestern corner of the state.

KENTUCKY. A little chalcopyrite has been found in Livingston and Union counties, but the deposits do not promise to be of any special value industrially.

LOUISIANA. No copper deposits of industrial importance are known in this state, but there is an interesting occurrence of chalcopyrite in a peak deposit of galena, sphalerite and baryte in halite (rock-salt) on Belle Isle, near the mouth of the Atchafalaya river.

MAINE. Some of the earliest copper mining in America was done in the Pine Tree state, and a smelter was built at Taineston previous to 1840. Chalcopyrite is found in the lead mines at Lubec, also near Dexter, and in Sullivan, Franklin, Hancock, Topsham, Parsonfield, Whiting and elsewhere. Chalcopyrite, chalcocite, bornite, cuprite and tetrahedrite occur at Blue Hill. There are old copper mines near Calais, on the New Brunswick border, and about 1880 there was a local copper boom that led to the opening of mines at Blue Hill and Sullivan, in Hancock county, but these did not prove profitable or long-lived.

MARYLAND. Copper mines were worked in this state in colonial days and during the first half of the nineteenth century. There are three cupriferous measures of some little extent, and the copper mines of Maryland were actually of some importance as producers, until the discovery and exploitation of the rich native metal mines of Lake Superior put a quietus on copper mining along the Atlantic seaboard.

The Maryland ores are mainly chalcopyrite and bornite, with occasional malachite. Of the three principal districts of the state, the most important is in Frederick county, running along the Linganore hills, from New London northward to a point beyond Libertytown, the ore occurring in slates and limestones. The second district, in Carroll county, is found mainly between Sykesville and Finksburg, with the ore in slates. The third district is in Baltimore county, at Bare Hills, where sulphide ores are found in hornblende gneiss.

MASSACHUSETTS. There is more or less copper at various points in the Old Bay State, and fitful attempts have been made at opening mines, but none have resulted from the short-lived operations. A little native copper is found in some of the triassic sandstone strata, and chalcopyrite is found in the lead mines at Southampton, also near Deerfield, at Turners Falls, Hatfield, Sterling, Rowe, Leverett, New Marlborough and Russell, also chalcopyrite and tetrahedrite at Newburyport. Prof. W. O. Crosby, of the Massachusetts Institute of Technology, furnishes me with particulars regarding the new copper prospect opened in western Massachusetts in 1902, a description of which will be found under the name of the New England Mining Co.

MICHIGAN. While the Keweenaw formation of Lake Superior outcrops in Wisconsin and Minnesota to the west, and upon the Canadian shore

of Lake Superior as well, the developed and productive mines of the district lie wholly within the limits of the state of Michigan. Copper ores are found in the granite lying north of the iron belt in Marquette county, and one mine is being developed thereon, but for all practical purposes the copper belt of Michigan is contained in the three counties of Keweenaw, Houghton and Ontonagon, stretching from east to west, from the point of the Keweenaw peninsula along the mainland of the western half of the southern shore of Lake Superior. There are also abandoned copper mines on Isle Royale, which is now practically uninhabited except in summer. The Keweenawan formation stretches through Gogebie county, and across the Wisconsin line into Minnesota, but there never have been any producing mines west of Ontonagon county.

The formation carrying the cupriferous lodes and veins of the Lake Superior district is composed of old lava flows, supplemented by beds of conglomerate formed by the deposition of rocks, broken from adjacent shores, upon old sea-beds. This belt of Keweenawan rocks, so called from its predominance in the Keweenaw Peninsula, where first noted by early geologists, is of considerable extent. It forms a trough, or synclinal, the southern edge outcropping on the Keweenaw Peninsula and to the westward along the southern shore of the lake, and it is with this southern edge that we have to do. The other outcrop of the rock strata forming this trough is noted on Isle Royale, and on the northern shore of the greater part of the western half of Lake Superior; also on the southern shore of the lake in Douglas county, Wisconsin, and again on Michipicoten island and the adjoining northern shore, at nearly the extreme eastern end of Lake Superior. The axial line of the synclinal seems to run somewhat north of east, but there is marked diversity in the trend of the southern outcrop where mining is actively prosecuted, the strike ranging from nearly due East and West to North 30° East in the Portage Lake district. Broadly speaking, Lake Superior rests in the trough of the Keweenawan series.

Discarding further consideration of the northern outcrop of the series, where the dip is to the southward, it may be said that the dip of all of the southern outcrop of the Keweenawan beds is to the northward or northwardward. The cupriferous strata on the Keweenaw peninsula have sandstone to either side. The underlying sandstone, to the east and south, is generally held to be unconformable with the traps of the Keweenawan group, and has been identified by Dr. L. L. Hubbard as of the Potsdam series. Copper is occasionally found in the eastern sandstone, near the point of contact with the trap, where evidences of igneous influence are quite plainly discernible; and in Ontonagon county fine copper has been found in the overlying sandstone conglomerate of the Porcupine mountains. The western sandstone is superimposed upon the Keweenawan beds and is apparently in place.

The outcrop of the Keweenawan formation, between the two sandstones, is from two to six miles wide, roughly speaking, and is narrowest where the dip of the strata is greatest, and widest where the strata dip least sharply. Toward the middle of the Keweenaw peninsula the western sandstone is lost under the lake, and at Bete Gris bay the eastern sandstone also plunges beneath

Lake Superior, leaving the traps and conglomerates in sole possession of the tip of the peninsula for the last ten miles, the waters covering the entire formation at the end of Keweenaw Point.

The Keweenawan series consists of three elementarily distinct classes of rock, though the subdivisions are numerous. These principal groups are the traps, amygdaloids and conglomerates. The two former are old lava flows, while conglomerates are composed of broken rock, sand and gravel, cemented by pressure, and were once seabeds. The traps and amygdaloids are in many respects similar, the main difference being in the greater density and uniformity of the traps. The copper is found in a chemically pure, or native state, in the amygdaloids and conglomerates, and occasionally, to a limited extent, in the traps. The theory most commonly held is that the copper was deposited by precipitation in the cavities in the strata from the waters of a sea above. The traps being dense rocks, usually basic, there was little chance for the deposition of copper therein. The amygdaloids contained an infinite variety of granular and crystalline rock forms, the calcareous and silicious portions of which were dissolved quite readily by the waters, presumably powerfully impregnated with salts, and in the apertures left by the dissolution of the chalky and sandy nodules, the copper was deposited when precipitated from the waters above. There is also a theory that the copper is purely of igneous origin.

A cross-section of the formation at any given point would show a large number of trap, amygdaloid and conglomerate strata, lying one upon the other, from south to north. These vary greatly in thickness, but are persistent both as to length and depth. There must necessarily be an end to even the greatest lava-flow, and owing to inequalities existing on the land-surface or sea-bed over which these old flows spread, the stratum may be temporarily cut out, to reappear at greater depth, or to the sides of the point of disappearance.

Geological observation in the Lake district has been founded very largely on the conglomerates as base-lines, and many conglomerate reefs have been identified and traced for considerable distances. This system of geological identification is obviously correct, as the conglomerates differ more radically from the traps and amygdaloids than do the latter from each other. All of the various strata of traps, amygdaloids and conglomerates vary from each other to a greater or less extent, according to their chemical and petrographical formation, crystallization, and alterative influences to which they were subjected after their original deposition. Some of the traps are blue, others greenish in color, with various minerals added to the original diabase, such as augite, prehnite, calcite, and others. In addition to the diabase, there are felsite and porphyritic rocks, richer in silica.

Of the conglomerates, many carry copper in minute quantities, but only two have been mined, these being the Calumet and Allouez conglomerate reefs. Nearly all the amygdaloids carry copper to some extent, but not all have it in sufficient quantity to render mining profitable. With the exception of three mines working on conglomerates and two on veins, all the active

mines of the district, including producers and properties in process of development, are opened on amygdaloid lodes.

In addition to the main portion of the Keweenaw series, which consists principally of eruptive rocks, a second division, mainly of sedimentary rocks, was formed at a later period, and in this second division the Nonesuch mine, in the Porcupine Mountains, was opened and found very rich in fine copper. The second division of the Keweenaw series was formed mainly by the breaking down of the eruptive rocks of the preceding formation, and the redeposition of the detrital rock so secured in the form of conglomerates and sandstones.

The crystalline rocks stand higher than the adjacent strata that had less power of resisting the elements and glacial action. These latter have been much eroded in ages past, in consequence of which the copper-bearing belt forms a ridge rising from 400 to 800 feet above the level of Lake Superior, with the sandstone sloping to the water from either side. In many places, especially at the crests and escarpments of the igneous strata, the naked rock stands out strongly, but the lower portions are covered with drift. In places an overburden of 200 or more feet of sand is found surmounting the rock, and swamps above the ledge of solid rock are of frequent occurrence. These are serious obstacles to the locating of mineral deposits, and also hinder the geological exploration of the district.

The dip of the various strata, copper-bearing and otherwise, varies greatly at different points, ranging from 73° with the horizon at the Baltic, to as flat as 25° at the Arnold. In a general way the dip of the trap series is sharpest when the trap belt, as exposed at surface, is narrowest; and flattest where the trap formation is widest. In a general way it may also be said that the dip of the strata is sharpest nearest the eastern sandstone and flattest nearest the western sandstone, an evidence of a folding or pushing force exerted from the direction of the eastern or Potsdam sandstone. The contact of the eastern sandstone is much tilted from the apparently horizontal position occupied a little further east, the sandstone standing almost vertically at some places where adjoining the eruptive rocks.

In addition to the copper-bearing amygdaloids and conglomerates, there are other sources of copper supply of minor value. The first of these in importance, judging from the amount of copper produced in the past, is found in the fissure veins. These cross the formation at approximately right angles and as a rule are nearly vertical in dip. The copper in these was presumably deposited in the same manner as the crevices in the amygdaloids and traps were filled with the same metal. The second source of copper is in the contact veins, of which the old Minnesota mine affords much the best example. The third source of copper is found in the ores. The Cliff, the first and one of the greatest dividend-payers among Michigan copper mines, was opened originally as a mine of black oxide of copper. The Calumet & Hecla was noted, when first opened in 1866, for the large amount of malachite found in the conglomerate near surface but in this instance the carbonate had been formed by the action of the elements from the native copper, which replaced

it at a little depth. Various fissure veins of copper ore have been found, especially on Keweenaw Point, well toward the eastern end.

The existence of native copper on the southern shore of Lake Superior was first made known to the world by the intrepid Jesuit missionaries of France, who visited the unknown inland sea early in the Seventeenth century. Native copper was found by other explorers in that and the succeeding century, and in 1770 one Captain Jonathan Carver printed a book in London, telling, among other things, of the richness of Lake Superior in copper, which had but to be picked up and carried away. This led to the formation of a copper mining company in London, and a party of miners sent over from England worked on the banks of the Ontonagon river in the winter of 1771-72, under the direction of Alexander Henry, an adventurous Englishman who had turned hunter, trapper and finally miner. A long adit was driven in a clay bank; this caved in when the rains came in the spring, and no further attempts were made at mining copper for seventy years.

In 1830 the southern shore of Lake Superior was first visited by Dr. Douglass Houghton, of Detroit, a young scientist combining with his technical skill rare and valuable courage and practical knowledge of men and matters. Through his indefatigable efforts the upper peninsula of Michigan was first surveyed, and the discoveries of Dr. Houghton led to the exploitation of both the copper and iron measures of the Lake Superior district, now among the most valuable and productive mineral fields of the world. The first "miners" to reach the Lake Superior copper fields were Jim Paull and Nick Miniclear, two backwoodsmen who came overland from southern Wisconsin in midwinter, suffering great hardships, and arrived on the shore of the great lake in March, 1843. The federal government opened a land office at Copper Harbor in the same year, and a number of hardy prospectors begun work before navigation was closed by the storms of early fall. More miners, most of whom were devoid of practical knowledge, arrived in the following year, and as the news of important discoveries became bruited about, the first Cornish miners arrived to do real mining. The operations of the first two or three years were productive of little but knowledge, secured by mistakes that now appear ridiculous. The first copper in any quantity of importance was taken from a vein of melaconite in Keweenaw county in 1846; the same company opened a fissure vein of native copper a little later, and begun the payment of dividends in 1849, since which time there have been dividends paid in each successive year by Lake Superior copper mines. But little later than the early operations of the Cliff company in Keweenaw county were the pioneer operations of the Minnesota company, in Ontonagon county, at the other end of the district. Extensive remains of prehistoric mines were found at many points, and a number of the best mines of the district have been developed on lodes revealed by lines of old pits.

" In the earlier years of development the profitable mines were opened on fissure veins in Keweenaw county, and on the contact veins of Ontonagon county. The middle, or Portage Lake district, was held to be of little promise, and the attempts made to open paying mines on the stratified beds were

regarded with amused contempt by the successful operators of vein mines, until at last the Quincy mine made a success of an amygdaloid lode. At present all but two of the active mines of the Lake district are opened on stratified beds, and of the two remaining mines, one is equipping a mill to treat copper from fissure veins in Keweenaw county, and the other is reopening the old contact vein of the Minnesota mine in Ontonagon county, in addition to developing a new mine on an amygdaloid bed.

MINNESOTA. The western continuation of the Keweenawan cupriferous formation extends from the upper peninsula of Michigan across northern Wisconsin into Minnesota. The Keweenawan rocks are found in Cook, St. Louis and Pine counties in the northeastern part of the state and short-lived attempts at prospecting have been done in all three counties. Native copper and malachite have been found in Chisago county. An occurrence of copper of geological interest, though of no commercial importance, was noted in St. Louis county in 1900, when the Montana shaft of the Minnesota Iron Company yielded about 100 pounds of native copper, found in sheet form imbedded in iron ore, at a depth of about 300 feet.

MISSOURI. Carbonate and sulphide ores occur at a variety of points in this state, and a number of small mines have been opened, though none are now working. Native copper and various ores are found in the Stanton mine in Franklin county. Malachite, azurite and chalcopyrite occur in the Circle Diggings of Cole county, and at the Collins mine in Cooper county. Malachite has been found in the Cherry Valley mines of Crawford county. A little chalcopyrite is found at times with the sphalerite in the zinc mines of the Joplin district, in Jasper county. The O'Bannon and Buckeye mines at Fredericktown, Madison county, were once worked for copper, and while in the Catherine lead mines, near Fredericktown, in October, 1902, I secured a little chalcopyrite from magnesian limestone carrying disseminated galena. Chalcopyrite has been found in Jefferson county, and Shannon county had a short-lived copper boom in 1901.

The Cornwall and Swansca copper mines were opened in 1863 on parallel blanket veins of disseminated chalcopyrite with chert gangue in a country rock of silurian limestone. The southern half of the state, from the Mississippi river to the Kansas line, possesses great mineral wealth, and while the principal developments will probably be in lead, zinc and iron, the opening of a profitable copper mine is by no means impossible, as the southern Missouri formation of magnesian limestone of carboniferous age, intruded by granite and porphyry, is one that has given to the world some of its best copper mines in other fields.

MONTANA. The Butte camp of Silver Bow county is now, and for several years has been the largest producer of copper of any district in the world. Copper ore is found in the counties of Beaverhead, Cascade, Deer Lodge, Granite, Jefferson, Madison, Meagher, Lewis & Clarke, Park, Silver Bow and Teton. A little mining is done outside of Silver Bow county, and in these dis-

tricts the ores are mainly sulphides, usually in association with diorites appearing as intrusives in a quartzite country rock of Cambrian age.

The Butte camp is approximately a rectangle of four by seven miles, but the more important mines and principal production are in an area of little more than two square miles. From this little spot has come hundreds of millions of dollars worth of copper, silver and gold, and under normal circumstances the production of this district, small only in area, is not less than 10,000 tons of refined copper monthly—an amount fifty per cent greater than the output of any other cupriferous district of the world.

Butte was originally a placer gold camp, but as such was of small importance and short life. Silver mines were opened later, and these turned into copper mines at depth. As early as 1880 the Parrot and Boston & Colorado mines were making argentiferous matte, and in the following year was begun the great development that transformed Butte into the world's greatest copper camp within a decade.

The country rock of the Butte district is granite, of which the Butte granite is the elder and the Bluebird an intrusive. The ore bodies are of very irregular form, occurring in veins ranging from mere seams up to 100 feet in width, with many bulgings and pinchings from point to point, but with a general tendency toward greater width at depth. The veins are considerably faulted and cut by horses of dykerock. The walls are poorly defined in many cases, and this gives rise to the plausible theory that the veins have been formed along a series of small fissures marking a line of disturbance, rather than from a general faulting, and that these small fissures have been greatly enlarged at many points by replacement of the original walls. The veins are nearly all mineralized and form a veritable network underground, crossing, interweaving, pinching, enlarging and behaving generally in the most erratic manner. The damnable mining laws of the United States are peculiarly adapted to the fomentation of mining litigation, and as a consequence of the physical and scientific impossibility of determining the apices of many of the veins, the principal mining interests of this district have become entangled in a maze of lawsuits that cannot be settled during the lifetime of the present generation, unless the litigants can arrive at some understanding out of court, or the weaker parties be driven to the wall. That the mines work and earn good profits after paying the millions spent in litigation is strong evidence of the richness of the district. In a camp like Butte, every mining claim should carry its title to the side-walls, and not an inch beyond. Any other system, and most especially such a cumbersome and dishonest system as furnished by the present federal mining laws, is an incentive to rascality, a discouragement to legitimate mining, and a disgrace to the country responsible for laws so utterly at variance with common sense and common honesty.

The gangue of most of the ore bodies is granitic or silicious. A little native copper is found in the granite at points. In the case of most mines of the district the upper levels carry high values in silver with only a trivial amount of copper, the latter averaging one per cent. or less. This oxidized zone

has a depth of 200 to 400 feet as a rule. Below this there is a median zone, frequently characterized by veins almost or quite barren of either copper or silver values in the upper section, followed by the richer sulphides. This middle zone varies greatly in characteristics in different shafts. The third or lowest zone is found at about the water level, where the ore becomes unaltered iron sulphides. Unfortunately for the peace of mind of geologists and mineralogists, the Never Sweat mine is now producing the extremely rich ore chalcocite from its 2,200 foot level. This occurrence does not fit in with any of the generally accepted theories of copper deposition, which is bad for the theories. Below the permanent water level the ore bodies, while retaining full width and strength, give constantly decreasing copper values with added depth. The deepest shaft in the Butte district is now down nearly a half mile, and, excepting the chalcocite in the Never Sweat, the percentage of copper decreases in a fairly steady ratio as depth is gained. The Anaconda, which started with 55 per cent ore, is now averaging but a little over 3 per cent copper. There are still lower grade deposits of immense area in the district, as at the Modoc mine of the Anaconda and elsewhere, and in view of the great improvements in metallurgical processes made during the past decade, such ores may be used eventually. While Butte is most distinctly working into a lower grade camp each year, it must not be inferred that the high grade ores are exhausted. All of the big mines have considerable reserves of rich ore, other high grade ores are locked up by litigation, and still others are being developed every year.

Mining developments of the past two years in the flat east of the city indicate that the productive area of the district will be greatly increased, and possibly doubled, in the future. While Butte is no longer the high grade camp of ten years ago, and at least one of its great mines has probably passed its zenith, the district is by no means decadent. It is not likely that any man now living will survive to see the last ton of copper made by Butte mines, nor even live long enough to draw the last dividend paid by a Butte copper mine.

NEVADA. The development of silver mines of fabulous richness, coupled with political exigencies, brought Nevada into statehood, some forty years ago. Beyond working the silver bonanzas along the extreme western edge of the state, there was little mining development attempted, though prospectors brought in reports of rich discoveries from every county. Lack of railroad lines, coupled with a sparse population and mountainous topography, discouraged exploration, and for these, and possibly other reasons, Nevada has received less attention from the miner than any other of the western mining states. Of late this old order of things seems to be changing, and better times are in store.

Copper ore is reported from the counties of Elko, Esmerelda, Eureka, Humboldt, Lander, Lincoln, Nye, Storey and White Pine. Mines are now being developed, and while operations are upon a rather small scale at most of them, promising properties are being opened in several cases. The state is still most inadequately supplied with railroads, wagon-roads and people, and

these drawbacks will deter the development of copper mines until partially overcome, but it is probable that the future will see an increasing interest in the mining of copper, as well as of gold and other metals, especially as Nevada lies between California and Utah, two of the richest mineral states of the Union, and the general geological conditions are much the same in these states and Arizona as in Nevada.

NEW HAMPSHIRE. Copper ores are noted at a number of points in this state, more especially in Grafton county. There are also deposits of apparently considerable extent in the Mt. Gartner district, near Woodsville, and chalcopryite has been found at other points, including Franconia in the White Mountains, where the ore occurs in gneiss.

NEW JERSEY. The first copper mine in the United States was opened in New Jersey, and this, the old Schuyler mine, discovered in 1719, is now being worked by the Arlington Copper Company. The Schuyler was worked upon what was considered a large scale in those days, and made its owner wealthy. Work was suspended when the Revolutionary War begun, and the mine has never been steadily worked since that time, although it has been operated spasmodically, on several occasions.

Ore deposits of low grade are found at a number of points in this state, and there is considerable native copper in the vicinity of Somerville, Flemington and New Brunswick. There are also old copper mines at Belleville, Griggstown and New Brunswick, most of which were small and unsuccessful. As the known deposits of ore and native copper in this state are of low grade, it is obvious that success can be secured only by the operation of mines upon a fairly large scale.

NEW MEXICO. Native copper has been found in the Santa Rita mines of Grant county, and copper ores are found at many points in the state, having been noted in considerable quantities in the counties of Grant, Lincoln, Rio Arriba, Santa Fe, Sierra, Socorro and Taos. General geological conditions are favorable to the finding of profitable mines, and there are several properties of considerable magnitude and good promise, notably the Aberdeen, at Lordsburg, which is a dividend-payer, the Santa Fe, Santa Rita and others. There is much prospecting for copper in progress, and a number of mines are being opened in the various counties. New Mexico has had a rather poor standing among mining men for the past fifteen or twenty years, due to some large failures scored in the territory in early copper mining ventures, but these seem to have been the fault of general conditions rather than to have come from the lack of ore. The first mining ventures were carried on under great disadvantages, and it is unfair to the territory as a whole to condemn it because of the failures of a few mines. There are many more failures than successes, even in the best copper mining districts of any state or country, and in the neighborhood of the greatest successes will nearly always be found the biggest failures.

NEW YORK. The Empire State has no copper mines, although copper ores have been found at a number of points. Chalcopyrite is found at the An-cram and Beckee lead mines in Columbia county; at Ellenville and the Red Bridge lead mines in Ulster county; with arsenopyrite near Wurtsboro, Sullivan county; in Chester, Warren county; Eastchester, Westchester county; Crown Point, Essex county; Alexandria and Antwerp, Jefferson county; Salisbury, Herkimer county, and at Canton, Fowler and the Rossie iron mines in St. Lawrence county. Malachite and cuprite occur at Ladentown, Rockland county, occurring in thin seams in the trap, and azurite, malachite and chalcopyrite have been found near Ossining, Westchester county.

NORTH CAROLINA. This is an important state, rich in mineral resources, and although it has never been a considerable producer of copper, may become such in the future, as its ore measures are of large extent and decidedly promising at some points. The state had several small copper mines in regular operation before the Civil War, and has been a regular though small producer of the metal for some years past. In view of the present interest in copper mining in this state it seems probable that the production will be increased by the making of several mines of fair size.

So far as can be determined by the limited geological research given many of the counties, and the developments to date, the most important copper measures of the state are contained in the counties of Ashe, Rowan, Person, Cabarrus and Granville, but copper ores are also found in the counties of Alexander, Alleghany, Caldwell, Catawba, Chatham, Clay, Davidson, Gaston, Guilford, Jackson, Lincoln, Madison, Mecklenburg, Mitchell, Montgomery, Moore, Rockingham, Swain, Transylvania, Watauga, Wilkes and Yadkin, and very possibly in several others as well. The ores are mainly sulphides, considerable chalcocite being found in Ashe and adjoining counties, but native copper has been found at the McCulloch mine in Guilford county, and all of the commercial ores of copper are found in the state, as well as a long list of the minor ores. The variety of copper minerals noted in North Carolina is probably nearly or quite as great as in Arizona.

The Virgilina district, on the border of Virginia and North Carolina, and including the counties of Person and Granville in the latter-named state, has sulphide ores occurring in lenses longitudinally, and apparently in series vertically, as proven by developments to about 300 feet in depth. The Virgilina district is in the sub-Piedmont division of the Appalachian belt, and in the same division, considerably further south, is found the Gold Hill district, where there has been considerable development, and where the ores apparently hold their full values to the greatest depth reached, which is slightly under 1,000 feet, the ore running 1 to 10 per cent copper, 2 to 4 ounces silver and about \$2 per ton in gold. The area of the Gold Hill field, as far as determined, is about 25 miles in length by one mile in width. The chalcopyrite occurs in quartz and a decomposed schist.

OHIO. Native copper nuggets brought down from Lake Superior by glacial action are frequently found in the drift in this state, and native copper

nuggets and ornaments are taken from the mounds built by a prehistoric race, but such occurrences are not of industrial value, and are of but slight geological interest. So far as reported, no trace is found of any copper deposits in place in the state.

OKLAHOMA. Copper ore has been found in small quantities at several points in this territory, but so far as known none of the discoveries are of much promise. A little excitement was caused late in 1901 by the finding of copper ores in the hills of Wood and Woodward counties, but nothing came of the discoveries.

OREGON. Copper ores are found in a number of districts in this state, notably in the counties of Baker, Grant and Josephine. The St. Helens district is regarded as of promise. In Josephine county, just north of the California line, the copper belt of that state continues into Oregon, general conditions being similar to those in Del Norte county, California. The Dietrick district in Josephine county is the scene of some little activity in copper development at present. The ore in this district carries good values in gold and silver, as well as high percentages of copper, and the veins are said to be of good width. The Burkemont district is in eastern Oregon, and is apparently a continuation of the Seven Devils district of western Idaho, which it adjoins. There are considerable bodies of low-grade ore in this district, and it is evident that profitable mines can be made only by large development and the steady production of a large ore tonnage.

PENNSYLVANIA. Although copper mining was undertaken in Pennsylvania more than a hundred years ago, the state yet lacks a copper mine. The earliest attempt in this line was at the Gap mine, in Lancaster county, which was opened as a copper mine in the eighteenth century, and was a failure as such, but was reopened as a nickel mine about 1850, and was successfully operated for that metal, with a small incidental production of copper, until 1893, when the richer mines of the Sudbury district of Ontario brought about a fall in the price of nickel that closed the Gap. There are copper ores at a number of points, mostly in small quantities. Native copper, chalcopyrite, azurite, malachite, chrysocolla, cuprite and brochantite are found at Cornwall, Lebanon county. The Perkiomen mine in Montgomery shows as long a list of copper minerals. In an abandoned lead mine at Schuylkill, Chester county, a variety of ores and native copper occur, and chalcopyrite is found in the Elizabeth mine at Norwich, in the same county. Native copper and cuprite have been found near Gettysburg. Native copper, malachite, chrysocolla, chalcopyrite, cuprite, melaconite and aurichalcite occur at Jones's mine, Morgantown, Bucks county, and malachite has been found at New Britain in the same county. Oxide, carbonate, sulphide and silicate ores have been found in small quantities in the quarries of Frankford, a suburb of Philadelphia. Bornite has been found in York county, and sundry ores are reported from Montgomery county. A little prospecting for copper has been done during 1902 in Pottstown and also at Tunkhannock.

RHODE ISLAND. There are no mines of copper in this little state, but chalcopyrite ore is found at Portsmouth, and malachite, azurite, bornite and chalcopyrite occur at Cumberland, while malachite, azurite and chalcopyrite have been found at Johnston.

SOUTH CAROLINA. Chalcopyrite has been found in the Fair Forest gold mines, in Union county, but, so far as known, there are no copper deposits giving promise of making mines within the limits of the state.

SOUTH DAKOTA. In the southwest corner of the state of South Dakota, arising from an extensive plain and isolated geologically, is the peculiar mountainous region known as the Black Hills. These mountains are a veritable storehouse of nature's mineral wealth, and there are but few metals not found here in greater or less profusion. The presence of copper was noted by early explorers, but in the all-consuming search for gold the other metals were neglected until a few years ago. Copper ores are in demand at the local smelters for use as fluxes in reducing refractory gold ores, being preferable to the barren fluxes that would otherwise be necessary. Geologically, the copper measures of the Black Hills have been compared by several scientific observers with those of the Ducktown district of Tennessee. The principal mining developments have been made in Pennington county, where several copper mines are now being developed.

TENNESSEE. The proven copper deposits of Tennessee occur in Polk county, in the extreme southeastern corner of the state, although the discovery of high-grade copper ore was reported from Lawrence county late in 1902. A little native copper is found in the Ducktown mines, but the important source of supply is chalcopyrite. The Ducktown district was discovered circa 1840, and as early as 1854 there were two blast furnaces in operation at that point. A thriving industry had been built up and the prosperity of the district seemed assured when the Civil War brought mining and smelting to a standstill, and work was not resumed until some years after the war, and then in a small way only. A British syndicate did the first post-bellum work, and has been followed by a strong American company. The copper industry of the Ducktown district seems to be on an assured footing again, with every prospect of growth in the future.

TEXAS. A little native copper is found in Burnet and Llano counties, and there are ores of chalcopyrite in both counties, as well as argentiferous tetrahedrite in the latter. Carbonate and silicate ores are exposed at a number of points along the Brazos river, in the Permian sandstones. Malachite and azurite, also chalcopyrite and bornite, in a quartz gangue, have been found in a prospecting shaft four miles north of Llano, the ores carrying 0.11 ounces of gold and 2.5 ounces silver per ton. A hand-picked sample of tetrahedrite from Babyhead Mountain, Llano county, gave 107.8 ounces silver and 6.4% copper. The White Eagle Copper Company, operating in Burnet county, has developed a mine by shaft and an open cut. It is prob-

able that copper ores will also be found in several other counties of the Texas mineral zone.

UTAH. Copper has long been produced from Utah mines, but until quite recently the metal has been obtained only as a by-product from the smelting of gold and silver ores. With the development of the Utah and Bingham mines of the West Mountain district of Salt Lake county, a new era has been entered upon, and Utah's copper output is increasing rapidly. The principal producers are in Salt Lake county, but there are very promising properties in process of development in Beaver county, and there are also copper ores and occasional exploitations in the counties of Juab, Piute, Summit and Tooele.

The mines of the West Mountain district are of exceptional promise, and are already considerable producers. All of them carry gold and silver in sufficient quantities to materially reduce the cost of copper production, and greater attention is being paid to copper-bearing veins in the older mines, some of which are proving valuable. Some of the properties in Beaver county are among the most promising to be found anywhere, at a similar stage of development. Utah has long been one of the solid mining states of the Union, and its mines, largely developed and owned by local capital, until within the past few years, have an enviable record of dividends. Some of the newer copper mines of Utah are in a position to make copper so cheaply, owing to the gold and silver secured as by-products, that Utah must be included in any possible list of the important copper-producing districts of the world.

VERMONT. There are deposits of chalcopyrite at South Strafford, Vershire, Waterbury, Shrewsbury, Berkshire and Corinth in this state, and copper mines have been operated in the past in three districts, at Vershire, South Strafford and Berkshire. The Ely mine had a smelter at Vershire circa 1861-1870, and worked with more or less regularity, but was forced to go out of business by the greatly decreased price of copper following the Civil War. The Elizabeth mine at South Strafford and the Ely mine at Vershire are now in the hands of George Westinghouse, of Pittsburg, and a limited production was effected in 1901-1902 from the Elizabeth, where about one hundred men were worked, while the Ely is being reopened and put in readiness for production. The other mines are idle. The Vermont ore is chiefly chalcopyrite, ranging from 3% to 30% copper, with an average of probably 5% to 10%.

VIRGINIA. Virginia has an auriferous-cupriferous mineral belt, stretching from the Piedmont district in Orange county to the North Carolina line. Copper ore has been noted in the counties of Buckingham, Carroll, Grayson, Fauquier, Fluvanna, Franklin, Greene, Halifax, Loudoun, Louisa, Montgomery, Nelson, Orange, and Polk. There are copper mines of small extent in Fauquier and possibly in other counties of the state, but the largest mines and principal development are found in Halifax county. The Virginia district lies in both Virginia and North Carolina, the Virginia portion

being in the county of Halifax. This district, as developed, is about twenty miles long by three miles wide, with indications of copper beyond these boundaries. The ores are chalcocite and bornite in a quartz gangue, and average possibly no more than 3%, though having frequent chutes running 20% to 30% copper. The ores of this district, as mined, average about one dollar gold and six to ten ounces silver per ton, and, with their gangue, run from 4 to 10 feet in width. There are fourteen mines in this district, of which four are producers, with the others developing or idle. The advantages enjoyed by the mines of the Virgilina district are cheap fuel and labor, an equable climate and proximity to the Atlantic seaboard, with which there is good rail communication. Several strong companies are now operating in this field, and it is likely to be heard from in the future as a considerable producer, the gold and silver values being sufficient to permit the operation of low-grade and narrow ore bodies that would otherwise offer little promise of adequate returns.

WASHINGTON. There are copper deposits in King, Stevens and other counties of this state, and a little attention is being paid to copper mining at present. None of the mines have yet advanced to a stage where it is possible to predict a certain future, but some promising prospects are under development.

WISCONSIN. There are copper ores in the zinc and lead district of southwestern Wisconsin in the vicinity of Shullsburg and Mineral Point, and some crude attempts at mining copper have been made at the latter-named town. Chalcopyrite and malachite have been found in Sauk county, and in 1902 a diamond drill boring north of Osceola gave cores assaying well in copper and with small values in gold and silver.

The northern fold of the Keweenaw trap formation extends across the Lake Superior shore of northern Wisconsin from Bayfield to the Minnesota line, carrying more or less native copper in the mineralized amygdaloids. This formation is described in the article on Michigan. A number of small shafts have been sunk on this fold of the Keweenaw formation, in Douglas county, but no mines have resulted from the work. The most extensive work was done at the Chippewa property, which came to grief financially late in 1902. A recent development, which is apparently much the most important ever made in the state, is noted in the southern end of Douglas county, where the Minong Range Copper Company is sinking two shafts in an amygdaloid. The importance of this work lies in the fact that the formation dips northward at this point, showing that the shafts are on the southern fold of the synclinal, this being the fold on which all the profitable mines of Lake Superior native copper have been opened, all mines on the northern fold having proved failures. Considerable heavy copper has been secured in one of these shafts, and the outcome will be awaited with interest, as the making of a paying mine at this point would treble the area of the possibly profitable zone of the Lake Superior copper field.

WYOMING. Although Wyoming is one of the newest copper fields of the United States it is by no means least in promise, and the Grand Encampment district has attracted wide attention, as well as the investment of large amounts of money. I am indebted mainly to Prof. Henry C. Beeler, state geologist, for the facts in the following summary of Wyoming copper deposits and prospects.

The principal cupriferous field of the state is the Grand Encampment district, having an estimated area of 2,500 miles, and lying in the southern half of Carbon county and the southwestern quarter of Albany county. The district is divided in two nearly equal parts by the North Platte river, and has the Sierra Madre Mountains to the west and the Medicine Bow range on the east. Encampment is the principal town of the district. While there were known to be promising mineral indications, little was accomplished until 1898, when gold prospecting begun. This was not especially successful, but copper prospects were located soon thereafter, and there has been increasing interest since then in copper development.

The general formation of the Sierra Madre is an irregular core of red granite, with fine-grained mica-hornblende schists of Algonkian age lying thereupon. Both schists and granite are cut at intervals by dykes of diorite and associated dyke rocks, the dykes running in apparent conformity with the strike and dip of the schists when traversing them. Associated with the schists and conformable in strike and dip are huge ledges of quartzite and altered schists known locally as lime dykes, the alternative material having been mainly lime, with some silica. Extensive evidences of replacement and alteration are frequently noted in the granite and diorite, as well as in the schists.

While the formations in general are fairly mineralized the principal ore bodies are found in the contacts between the schists and adjacent rocks, especially so in the contacts of schists and quartzite. The outcrops are usually of soft spongy limonite carrying some hematite, and often show a little quartz in the ore. These outcrops are noted on veins ranging from mere stringers to a width of 20 feet or more, and extend to water level, a depth of 35 to 100 feet. The iron oxides are usually associated with copper carbonates, the percentage of copper being small at surface and increasing with depth. A little chalcocite is found in the zone of secondary enrichment, but at or about the water level the ores change to chalcopyrite and bornite. Above the water level the altered ores are mainly malachite and azurite, with a little native copper. In several instances the outcrops are fairly pure specular or silicious hematite, associated with white quartz. In the cases where copper sulphides outcrop the same white quartz is found in association.

The district has been a producer since 1900, ores shipped assaying 30% to 49% in carload lots. This necessitated hand-selection and the rejection of the lower-grade ores. The high-grade ores carry \$8 to \$10 per ton in gold and silver. The district has a smelter which handles mainly low-grade ores, the product therefrom being shipped as high-grade matte. An interesting feature of this district is an aerial tram 16 miles long, in four

sections, running from the Ferris-Haggerty mine to the Encampment smelter, this being in successful operation.

The Medicine Bow range on the eastern side of the Encampment district has been prospected for years, mostly for gold, of which little has been found. In 1900 the Great Rambler mine, opened and abandoned as a gold property, was relocated for copper, and begun shipping ore at once. An interesting feature of this property is the finding of platinum in commercial quantities. The general formation of the Medicine Bow range is a gray and red granite, flanked more or less irregularly by schists and gneisses, with dykes similar to the Encampment district as before described. The Rambler is evidently opened in fissures in the black, dioritic granite, but its upper workings show alteration conditions similar to those prevailing to the westward.

Among the other copper districts of the state is the Laramie Hills, running along the southern state line from Laramie through Albany and Converse counties to Caspar, Natrona county. The formation is a granite core with north and south trend, flanked by schists and succeeding sedimentary formations. Copper is found native in red disintegrated granite at Sherman Hill, and as sulphide ores in prospects at Hecla, Slate Creek, Cooney Hill and to the northward of Laramie Peak. Copper ores have also been found in the Big Horn Mountains and in the Wind river districts, under conditions resembling those of the Grand Encampment district, though little development has yet been attempted on any discoveries in the two last-named districts.

The copper properties of the Encampment district are obviously of more than average promise, the richness of their ores and the considerable values carried in the precious metals enabling owners to develop properties from shipments secured near surface. The alteration zone is of shallow depth, however, and the ultimate value of the district must be determined by the values secured from the unaltered sulphides, on which little work has yet been done. The oxidized ores, however, will enable many owners to give their mines thorough tests at small cost.

CHAPTER VIII.

COPPER DEPOSITS OF CANADA AND NEWFOUNDLAND.

In this chapter the copper deposits of Canada are treated in detail, by provinces, and for geographical convenience, Newfoundland is added, although Newfoundland has never become a part of the Dominion of Canada.

While the metal has been mined for many years in the eastern provinces of the dominion, the Canadian copper industry was never of importance previous to the exploitation of the great nickel-copper deposits of the Sudbury district, in the middle eighties. Since that time the British Columbian fields have become prominent as producers, and the copper industry of Canada is apparently but in its infancy. The dominion must be included in any list of the principal copper producing countries of the future.

NOVA SCOTIA. Native copper is found in this province in the counties of Annapolis, Cumberland, Digby and elsewhere, while copper ores are noted in the county of Anitgonish, near Sidney, and at New Annan, Cape Breton, Colchester, Cumberland, Pictou and Sidney. The ores are mainly sulphides, and at Briar Island, Digby county, the native copper is found in grains in amygdaloidal trap, under circumstances similar to the occurrence of the native metal in the Lake Superior copper district. The Cape Breton deposits are of chalcopyrite, and carry both gold and silver, the ore having a silicious gangue and traversing diorite and felsite rocks.

Present developments in Nova Scotia are mainly in Cumberland and Cape Breton counties. The old Coxheath mines at Coxheath, Cape Breton county, are being operated, while other mines are being developed at Cape d'Or and Wentworth, in Cumberland county.

NEW BRUNSWICK. Copper ores are found in this province in the counties of Carleton, Charlotte, Gloucester and St. John, and native copper is found in certain of the older sandstones. There has been a renewal of interest in the copper deposits of New Brunswick within the past five years, and mines are now being developed at several points. While no striking successes have been scored as yet, there are several properties with good prospects, and it is hoped that some good mines may result from the work now being done.

QUEBEC. In this province copper ores have been found in the counties of Arthabaska, Bagot, Beauce, Brome, Dorchester, Drummond, Levis, Lotbiniere, Megantic, Missisquoi, Richmond, Sherbrooke, Shefford and Wolfe, and also on the north shore of the Gulf of St. Lawrence in the district of Saguenay. Mines have been opened at various times and points in several

of these counties, but the principal development has been at Capelton, in the little county of Sherbrooke, just above the New England border. The ores, like those of Ontario, are mostly chalcopyrite, and invariably so where found in quantities sufficient to justify the opening of mines. The sulphide ores of copper are frequently found in conjunction with pyrite and pyrrhotite, and are sometimes developed in mines first opened for pyrite destined for the manufacture of acids. The principal mines have been opened in limestone, near the point of contact with serpentine and diorite rocks, the limestones being more or less closely associated with slates. The Capelton mines carry 3 to 4 per cent. copper and 3 to 4 ounces of silver per ton. The sulphur from these mines is saved, as far as possible, for the making of acid.

ONTARIO. There are copper ores in this province at many different points, and at some of them large mines are opened, while in others mines are developing, and in still others mining work is confined to the merest prospecting. Ontario is a large province, and has a great diversity of topography and geological conditions, its frontier marching with New York in the east and Minnesota on the west.

Copper is found native at several points, but mainly as sulphide ores, and in the Sudbury district the iron-sulphide ores of copper are highly nickeliferous, so much so that this district furnishes more than half of the nickel supply of the world. As a rule the oxide and carbonate ores of the alteration zone are missing in Ontario, the unaltered iron sulphides, mainly chalcopyrite, with a little bornite, reaching to surface with slight traces of change.

The first copper mining in the province was undertaken at the Bruce mines, on the northern shore of Georgian Bay, in 1846, immediately after the opening of the first Lake Superior native copper mines of Michigan. After many years of idleness these mines are now being reopened. The first really important production of the metal after the suspension of work at Bruce Mines came from the discovery of the nickel-copper ores of Sudbury, in 1883, and their development. The ores of the Sudbury district are nickel-copper-iron sulphides, occurring in a country rock of diorite. Mines have been opened at various points in a district several miles square, in the vicinity of Sudbury and Copper Cliff. This district is a fairly large and increasing producer of copper, but, like all other good districts, has its wild-oats and failures, as well as its bonanzas.

Copper is also found in Lanark county, and in the Nipissing district. In the Parry Sound district there are numerous occurrences of the ore, the mineralized belt being of considerable area. This district is located along Parry Sound, on the east-central part of Georgian Bay. The geology of the district is as yet unsettled by the scientists, considerable differences of opinion existing among the various observers. The prevailing rock-forms of the district are gneisses and schists, and the formation shows marked flexion and faulting. There are numerous small quartz veins and frequent pegmatite dykes of large size and great persistence. The topography is rough and much of the rock is utterly devoid of vegetation or covering of

any sort, the bald knobs alternating with marshes and swales in the lower ground. The mineralized zone is apparently about a quarter-mile in width with a generally northeasterly and southwesterly trend, and has been prospected for about twelve miles. The ore occurs as extended and approximately parallel lenses with a general trend in line with the mineral belt, and the ore bodies are frequently capped with gossan. The ore, as a rule, is chalcopyrite, with a little bornite and occasional chalcocite, and is auriferous, gold values running \$3 to \$10 per ton in many cases. Some of the beds are nickeliferous also, the nickel running as high as 2.5 per cent. in some instances.

The district of Algoma, which is very extensive, has copper deposits at a number of points, of which the principal, judged by past development, is in the Bruce Mines district of Georgian Bay. This field also includes the Rock Lake district, sixteen miles distant, where one large mine has been opened and a number of smaller properties are developing. The ores are chalcopyrite in a gangue of quartz, apparently in true fissure veins giving every evidence of permanency. In the Goulais Bay district, north of Sault Ste. Marie, several promising prospects are in process of development. On the northern mainland of Lake Superior, to the eastward of Michipicoten Island, there are sulphide ores of which little is known, beyond the fact of their existence. On the island itself there are amygdaloid strata carrying native copper, this being the easternmost outlier of the Keweenaw formation of the western half of Lake Superior. Various attempts at opening mines on these beds of native copper have proven unsuccessful. Chalcopyrite, chalcocite and domeykite have also been found on this island, in small quantities.

On the northern shore of Lake Superior, east of Thunder Bay, native copper is found on Battle Island and St. Ignace Island in Nepigon Bay, and at Pointe-aux-Mines. Chalcocite occurs on Spar Island, and chalcocite and malachite are found on Silver Islet. In the Thunder Bay district chalcopyrite occurs at Neebing, and a little development has been made at Black Bay and Shebandowan Lake, on native copper in trappean rocks.

In the Rainy River district sulphide ores have been found at several points.

MANITOBA. The province of Manitoba is an agricultural rather than a mining district, but there is a small area of mineral land along the eastern boundary, near Lake of the Woods. A vein, running 18 to 20 inches wide, occurring as a contact between granite and trap, and traceable for a half-mile, has been slightly prospected at Ingolf station, very near the Ontario boundary. This is a pyrrhotite carrying copper, nickel and traces of gold.

BRITISH COLUMBIA. This Canadian province is a kingdom in both area and resources. Its wealth of timber and mineral has been merely scratched, and the development of the past decade, while very great, both actually and relatively, is but the precursor of a far greater work to be accomplished in the future.

The first mining was on placers, for gold, nearly half a century ago. When the placers were exhausted the mining industry languished until the completion of the Canadian Pacific railroad through to the west coast, when permanent mining began in a small way. The first mines were of gold and silver, lead becoming an important product a little later. When the mines of the Trail creek and Boundary districts were opened, less than ten years ago, it was soon found that many of the mines carried considerable copper values. The bulk of the copper production of British Columbia is secured as a by-product from mines of gold, silver and lead, but several exclusively copper mines have been developed. A peculiarity of British Columbian mines—and by no means a disadvantageous one—is that the gold and silver mines usually carry more or less lead and copper, while the copper mines have appreciable values in gold and silver.

There is more or less copper in practically every mining district into which the province is divided, but the mines of the Boundary, Trail and Coast divisions lead in output. The relative importance of the various districts as producers is shown by the following official table of production of refined copper in 1901.

Districts.	Production in Pounds.
Boundary	14,511,787
Trail (Rossland)	8,333,446
Coast	3,115,872
Nelson	1,599,449
All others	43,192

From the trivial output from the districts lumped together under the caption "all others," it must not be inferred that they are of no importance. Many mines of good promise are found in these districts, but lack of development and adequate transportation lines is responsible for small production.

British Columbia now has a number of smelters, all new and mostly large and modern. Excellent results are being secured at many of these, and Wm. Fleet Robertson, provincial mineralogist, estimates that the cost of smelting copper has been reduced as low as \$1.35 to \$1.50 per ton of ore. These figures are astounding, and coming from a less eminent and accurate source would be received with suspicion.

NEWFOUNDLAND. There are sulphide ores of copper at many points in this island, and native copper has been found in place in stratified archaic rocks, under conditions resembling those governing in the Lake Superior district, on Odorin Island in Placentia Bay, and elsewhere. One mass of native metal weighing 55 pounds has been found, and the geological horizon of the district in which these occurrences of the native metal are noted is apparently about the same as that of the Keweenaw district of Michigan.

The first mining in Newfoundland was done in 1862, at the Tilt Cove mine, which was reopened in 1887 by the Cape Copper Co., its present owner. There are also other copper mines on the island that have been worked to some little extent, among these being the Little Bay, which has reached a depth of 1,350 feet, the Lady Pond, Betts Cove, York Harbour and others.

CHAPTER IX.

COPPER DEPOSITS OF MEXICO, CENTRAL AMERICA AND
THE ANTILLES.

Under the heading of this chapter are grouped the Latin countries and islands of North America. With the exception of Mexico, which is a copper field of the first magnitude, and with the possible exception of Cuba, where there was once a considerable industry in the mining and smelting of copper ores, the developments noted in this chapter are of comparatively little importance.

MEXICO. The Republic of Mexico has made relatively greater strides in copper production during the past five years than any other country in the world. Not only has there been a most remarkable relative gain, but the actual gain in output puts Mexico an exceedingly close second to the United States in point of increase. That Mexico will soon lead Spain, and rank second only to the United States, seems assured. The Boleo has long been an important mine, but the copper production of all other Mexican mines was but 1,200 tons so recently as 1896. Since that time the Greene, Inguaran, Candela, Moctezuma, and other great properties have been developed. Those interested in copper will do well to keep an eye on Mexico for the next few years.

Copper in almost every known form is found in some part of the republic. The ore measures are extensive and include many different types of deposits. Argentiferous copper ores are frequently found in the crystalline slates of the Azoic group, a typical example being the district south of Puebla. Copper accompanied by hematite is noted in cretaceous beds of the Mesozoic, while in the Cenozoic group copper is found in regular veins in hornblende andesites of the Pliocene system, also in the stratified beds of sedimentary rocks of the upper Miocene and lower Pliocene, the Boleo mine in Lower California being an example.

According to the official figures furnished by the Minister de Fomento, the number of copper mines and cupriferous mines within the boundaries of the republic was as follows on July 30, 1899: Mines of copper only, 221, with an area of 2,184 hectares; of copper and lead, 5 mines, with an area of 31 hectares; copper and gold, 69 mines with 857 hectares; copper and iron, 23 mines with 159 hectares; copper and silver, 192 with 1,637 hectares; copper, silver and gold, 55, with 896 hectares; copper, silver and lead, 12, with 147 hectares. This gives a total of 577 cupriferous mines, and an area of 5,911 hectares, out of a total of 8,970 mines of all classes having an

area of 84,557 hectares in the entire republic. Taking into consideration the marvelous development of the three and a half years that have elapsed since the date of these statistics, it seems probable that the number of cupriferous mines in the republic is materially larger, unless the process of consolidation has absorbed more old mines than would offset the new openings. According to the summary of S. Chapman, F. S. S., made from the Mexican government's *Boletín de Estadística Fiscal*—date not given—the number of cupriferous mines in the republic is materially greater than the figure first quoted. Chapman's summary gives a total of no less than 839 copper mines of all classes, of which 281 are mines of copper only, the balance producing other minerals as well as copper.

Nearly every state and territory of the republic has copper mines, the roster including the states of Aguascalientes, Chiapas, Chihuahua, Coahuila, Colima, Durango, Guanajuato, Guerrero, Hidalgo, Jalisco, Michoacan, Morelos, Nueva Leon, Oaxaca, Puebla, Queretaro, San Luis Potosi, Sinaloa, Sonora, Tamaulipas, Vera Cruz and Zacatecas, also the territories of Tepic and Baja California, and the Federal District of Mexico. In point of output Sonora easily leads at present, with Lower California a good second. The more important developments in the other states are in Chihuahua, Michoacan, Durango, Coahuila, Guerrero and Zacatecas, though there is considerable activity in many of the other states, capital having been poured into Mexican copper mines by the tens of millions of dollars during the past five years. Under the strong but equable administration of President Diaz, Mexico has undergone a transformation during the past two decades. There are as ample safeguards for life and property as may be found in any part of Europe or the United States. The laws are administered constitutionally, rather than dictatorially, and the president has surrounded himself by statesmen of ability and honesty, under whose fostering care Mexico has become one of the favorite fields of investment for the surplus capital of Europe and America. While many failures have been scored, the percentage of successful mining investments made in this country of late years is unusually high.

Mexico has upwards of 300 smelters of all sorts, mostly very crude, but with a few of the most modern type and of immense size, notable among the latter being the fine plants of the American Smelting and Refining Company at Aguascalientes, Monterey and San Luis Potosi. There are also fine reduction plants at the Boleo, Greene Consolidated, Descubridora and other copper mines of the country.

The Sonoran copper deposits are of the Carboniferous system of the Paleozoic group. The principal districts of northern Sonora are La Cananea and Nacos. These are a short distance south of the Arizona line, and the geological, geographical and climatological conditions are practically the same as in the Bisbee district of Arizona, or, rather, the Bisbee, Nacos and Cananea fields are one district, divided by the international boundary line, and these fields, considered as one district, have furnished perhaps the most important copper mining developments noted on the globe during the past five years. There are other promising districts in Sonora, where devel-

opment work is in progress, but they have been overshadowed by the spectacular rise of the Cananea mines.

In Lower California there are some 30 copper mines of all classes, mostly insignificant, but the Boleo, operated by a French company, is a property of the first magnitude. This mine is opened on beds occurring in a formation of Tertiary sandstones, conglomerates and tufas. The cupriferous beds, three in number, of large area, lie upon conglomerates of varying horizons and are overlaid by argillaceous tufas, all traversed by fissures. In the upper bed, above the water level, the ores are disseminated oxidized ores, such as melaconite, cuprite, atacamite, azurite, malachite, crednerite and chrysocolla, all in quantities of commercial importance. In the second ore bed there are peculiar globular concretions of oxide and carbonate ores, called boleos, whence the name of the mine. The third bed, in addition to the oxide, carbonate, silicate and oxy-manganate ores, also carries sulphides, not the ordinary iron-sulphides, but chalcocite and covellite, the richest ores of copper. The ores are disseminated in irregular masses, veinlets and concretions, in a clayey tufa, with a marked tendency toward concentration upon the underlying conglomerates, where the ores occur compact in layers of 6 to 10 inches.

While Michoacan has not yet become a large producer, it has one very large property, the Inguaran, in process of development, and other properties of promise are also undergoing exploitation. The Ario district of Michoacan contains enormous bodies of sulphide ores, occurring quite evenly disseminated in granitic rock. It is obvious that these properties must be worked upon a very large scale to prove profitable, but as the Rothschilds are furnishing the money for the development of the largest mine, the district will receive the benefit of adequate capital in its development.

In the state of Coahuila there are several important mining developments. The same is true of Zacatecas and Durango. The state of Chiapas has some rich gold-copper mines, especially in the neighborhood of Santa Fe and Pichu-Calco. In the state of Guerrero there are good copper ore bodies, and a newly organized American company is preparing to develop mines on a large scale, south of the Balsas river in the districts of Braves and Travares, less than 40 miles from Acapulco, which lies on the Pacific coast. The claims made for this property are simply staggering, and if they did not come from an apparently responsible source, would be laughed at as preposterous.

COSTA RICA. There are outcrops of copper ores at several points in the republic, but no attempt has ever been made at opening mines.

CUBA. Copper ores occur at many points in the eastern part of the republic, and the province of Santiago was the scene of the first copper mining done in the new world. El Cobre mines, situated some thirty miles north of the city of Santiago, in the Sierra Madre mountains, were opened in the Sixteenth century and were worked with more or less regularity until 1834,

when the various mines of the district were bought by an English company and consolidated. From thence until 1868 the production averaged one million dollars in annual value. The richest ore was shipped direct to Swansea, while the low-grade ore was discarded and the medium quality reduced to matte for export to the smelters. The mines were opened to the depth of nearly a quarter of a mile and were equipped with excellent machinery and buildings. In the rebellion of 1868 the torch was applied by insurgents and the extensive plant entirely burned, since which time the mines have been idle, although a little copper has been obtained every year by natural cementation. Steps are now being taken for the reopening of these mines, which, in view of their past production and profits, are doubtless worthy of the great cost that their reopening and equipment will entail. There are also promising copper deposits in the province of Pinar del Rio, and elsewhere.

GUATEMALA. Excellent specimens of sulphide copper ores have been found at various points in the republic of Guatemala, but no serious attempts have been made at developing these resources, and I am unable to find trace of anything worthy the name of a copper mine in the country.

HAYTI. Copper exists at several points in Hayti, notably in the Hotte Mountain range in the southern part of the country. Previous mining developments have been of the crudest, but an attempt is now being made, under American management, to open regular mines of copper.

HONDURAS. There is copper ore in nearly every department of the little Central American republic of Honduras, but the development of mineral industries is not equal to the possibilities offered, and the only copper producer worthy of the name is the Eureka mine, in Orica Basin, department of Tegucigalpa, where a small production of gold, silver and copper is effected.

JAMAICA. Small copper mines were opened at several places in Jamaica many years ago, but the ore bodies proved meagre, so far as exploited, and the mines, being unprofitable, were soon abandoned. There are indications of copper and other metals at many points on the island.

NICARAGUA. A very limited amount of copper is produced in Nicaragua as a by-product from the smelting of silver ores. There are promising undeveloped copper ores in the department of Nueva Segovia, the development of which is rendered difficult by a mountainous country and poor roads. There are also occurrences of copper ores in the departments of Leon, Jinotega and Matagalpa, and in the district of Prinzapulca.

PORTO RICO. Copper ores occur at several points on this island, but, so far as can be ascertained, no serious attempts have ever been made to develop mines thereon.

SAN SALVADOR. There are deposits of copper ore at several points

in the republic of San Salvador, but efforts to secure details regarding them have not been rewarded as yet.

SANTO DOMINGO. There are copper, gold and silver ores in the San Francisco Mountains of the department of San Cristobal, and during the year 1900 concessions were issued to Señor Don Antonio Nascia for copper mining at Barrero, San Cristobal, to Señor Francisco Sezzato for copper mining in the same department, and to Señor Francisco Diaz for copper mining.

CHAPTER X.

COPPER DEPOSITS OF SOUTH AMERICA.

The various copper producing fields of this continent are treated alphabetically, by countries, in the pages of this chapter. The cupriferous measures of South America are of vast extent and great value, though as yet having but comparatively small development, except in Chile.

ARGENTINA. The Cordilleran copper belt that traverses portions of Bolivia, Peru and Chile is also found in the Argentine Republic, on the eastern slope of the Andes, in the departments of Tucuman, Cordoba, San Juan. La Rioja and elsewhere, and several mines, notable among which are the Rosario, Carmelita and Restauradora, have been developed, but have never been extensive producers, owing to the primitive methods used in mining and smelting, and the even more primitive means of transport employed, thirty mules being required to carry a ton of ore from the mines to the smelter. A wire rope tramway discounts mule power for such uses. Under such adverse circumstances it is scarcely surprising that Argentina made only 76 metric tons of copper in 1900.

A recently discovered copper deposit near Los Morteros assays 40 to 50 per cent. copper and is said to be well located for economical operation. The principal copper developments within the limits of the republic have been in the Cerro de Capillitas district, where a mass of fissure veins, forming almost a gigantic stockwerk, occur in granite, gneiss and porphyry, with a capping of trachyte. The ores developed in this district are tenorite, cuprite, malachite and azurite, with some bornite and occasional argentiferous tetrahedrite. It is possible that chalcopyrite will come in at greater depth, but the richer ores in the alteration zone are evidently of considerable depth, and are both auriferous and argentiferous as a rule. An English company now owns a number of the best properties of the Cerro de Capillitas district and can scarcely miss making a rich mine, if the large sums necessary for roads and modern machinery are expended judiciously.

BRAZIL. The existence of native copper and copper ores in Brazil has been known for many years, but until very recently no systematic attempt has been made at mining, and no official records kept of discoveries and operations. In fact, no information whatever has been obtained from any of the government officials, on the subject of copper deposits.

A mass of native copper weighing 2,616 pounds was uncovered many years ago, in the neighborhood of Bahia, and now reposes in the royal museum at Lisbon. Copper ores have been found, from time to time, at various

points in Brazil, among the more important localities of occurrence being Ouro Preto, Camaquan, Pelotas and various points in the state of Minas Geraes, which has long been noted for its large and profitable gold production. The only systematic work now under way in the republic is near Lavras, Minas Geraes, where a copper deposit found in the spring of 1901 gave assays running up to 75 per cent. metallic copper. This is owned by a company recently organized in Brussels, and thorough development is promised by the new owners.

BOLIVIA. The Andean copper belt of South America reaches through Argentina, Chile, Peru, and Bolivia, and general geological conditions are much the same in the cupriferous districts of all four countries. The exploitation of Bolivian copper mines has been hampered by lack of cheap and efficient transportation, and highly skilled labor is also hard to get and keep. All of the copper produced in this country is shipped through the Peruvian port of Mollendo.

The principal and at present the only active Bolivian copper mines are in the district of Coro Coro, department of La Paz. In this district there are two dissimilar sedimentary formations, apparently of different geological periods, similar only in their origin and cupriferous nature. The older and underlying formation, "Las Vetas," is an arenaceous conglomerate with argillaceous tendencies, having a northeasterly trend. Superimposed upon this stratum is another conglomerate, "Los Ramos," having a southwesterly trend. The upper conglomerate is much like the lower, but is darker in color and mottled with red and whitish particles of gypsum and other minerals not found in the older stratum. In many respects the La Paz field more closely resembles the Lake Superior copper district than any other. The country rocks are eruptive, mainly dioritic, and the copper is found native, as a rule, and only rarely as ores in quantities of commercial importance. Like the Calumet and Allouez conglomerates of the Lake Superior district, the Bolivian conglomerates carry the native metal in fine nodules, although masses, usually small, but sometimes very large, are occasionally encountered. Another point of resemblance is the occurrence of silver, always native, found associated with the copper, but never alloyed with it.

Next to La Paz, the most promising and farthest advanced district is that of Pacajos, where the output reached 1,000 quintals weekly in June of 1900. The same general conditions of labor and transportation govern in this district as in La Paz.

CHILE. Although Chile led the world in copper production about the beginning of the last quarter of the Nineteenth century, that country has lost ground as a producer, not only relatively, but actually. There is reason to believe, however, that the tide has turned, and the output for 1901 was the largest secured for many years. The secret of the sudden rise of Chile, its arrested progress, decline and final rejuvenation as a copper producer is found in the combination of geological, geographical and metallurgical conditions

under which the copper industry had its birth, its period of prosperity, its decline and its renaissance. There is copper ore in every province, and in nearly every district of every province of the republic. The ease with which the oxidized surface ores were secured and smelted gave rise to a large industry, but, like a fire of kindling wood, while quick and hot the industry was of short life, because the altered ores gave way at depth to the low-grade iron-sulphides. These are now being mined in increasing quantities, and the Chilean copper industry is more firmly established at present than at the height of its former prosperity, even though the annual production be smaller.

Copper deposits were worked in a limited way before the first white man set foot upon the soil of Chile. Under Spanish dominion a little copper was produced, but the industry did not begin to expand largely until the achievement of independence, about the third decade of the Nineteenth century, after which mining flourished greatly. Until 1842 the high-grade oxide and carbonate ores were smelted in charcoal furnaces, but in that year the first reverberatory furnace was built at Coquimbo, by C. Lambert, and in 1857 the first blast furnace was built by the same man. The period of greatest prosperity of the Chilean copper industry begun about 1850, and continued for nearly thirty years, after which there was a period of twenty years during which the industry lost ground slowly but steadily, this depression being followed by the beginning of better times, just at the close of the century. In 1881 Chile, Spain and the United States, the three greatest producers, made about the same amount of copper each, Chile having a slight lead with a trifle more than 41,000 long tons. From that point the output slowly declined to about 25,000 tons, fifteen years later.

Chile has two parallel copper belts, running nearly due north and south, and approximately one hundred miles apart. The principal development has been made in the western, or coastal belt, because of the greater ease of exploitation and transportation. The country rock of the Chilean cupriferous districts is composed mainly of strata of the Permian system, sandstones predominating. These have been extensively faulted, twisted, broken and upheaved by eruptive diorites. The general geological conditions are much the same as are found in the Mansfeld district of Germany, and in the governments of Perm and Elizabetopol in Russia. The Cordilleran belt, which lies back from the coast some distance in a country about as rugged as can be found anywhere, is so difficult of access, in most cases, that but little mining development has been secured, especially in the case of copper ores, on which the cost of transportation is so great as to preclude operations in any but the most favored districts. The two parallel copper-bearing belts stretch from Argentina on the south, into Peru on the northern boundary.

Summarizing from Prof. Ch. Vattier's excellent little brochure, "*Mineria i Metalurjia de Chile*," the principal copper-bearing districts of the country, as developed, are as follows, from south to north:

In the provinces of Santiago and Valparaiso is the mineral center of Las Condes, and the rich sulphide mines of Los Elguin, Bronces and Transito, with other centers of activity, as at Naltagua, Los Aguirre, Tiltill and Lampa.

In the province of Aconcagua are the well-known mines of Catemu, with the Melon group and other less-known properties. Lying next north comes the province of Coquimbo, ranking among the most important as a copper producer. The principal mines are in the departments of Combarbala, Illapel and Ovalle, including such first-rate mines as the Panulcillo and others less known. The province of Atacama is at present the greatest copper producer of the country. In the department of Vallenar there are numerous mines, among which are the Camarones and San Antonio. The department of Freirina is the location of the great Carrizal mines, upper and lower, and of other important producers. In the department of Copiapo are such great mines as the Dulcinea, Puquios, Nantojo and Tierra Amarilla. The department of Chafaral is the site of the great mines of the same name. The province of Antofagasta is among the greatest copper centers of the country, and has large and important mines in the departments of Taltal, where the mine Exploradora is located; in the neighborhood of Calama, department of Antofagasta, and in the department of Tocopilla.

The Cerro Blanco district is not on the coastal belt, but is located in the Cordilleran zone, the mines being opened principally in trachyte. These were originally opened for silver, but at the depth of about 600 feet a zone of rich copper-silver ore was encountered, and this, in turn, was succeeded at greater depth by unaltered iron-sulphides of good average values. The deepest mine of the district is the Agua Amarilla, which has reached a depth exceeding 1,500 feet.

Among the discouraging features of the Chilean copper trade, for the past twenty years, have been lack of railroads, inefficient labor, high wages and lessened values of ore bodies in the case of the older and deeper mines. Transportation facilities have been greatly improved during the past decade, the enlightened and progressive government of Chile having fostered railroad building, as well as taking a deep interest in the development of the mineral and other natural resources of the republic. General conditions are improving, slowly but surely, and Chile from now on should show gains in copper production. The resources of the republic in this mineral are scarcely excelled by any country except the United States.

COLOMBIA. While the republic of Colombia is noted for its production of gold and silver, little attention has been paid to mining for other than the precious metals. The existence of copper has long been known, but heretofore no attempts have been made at mining in any but the crudest manner, though small quantities of the rich oxidized ores near surface have been extracted at various points, from time to time.

Copper ores are known to exist in many departments, notable among which are Tolima, Rio Blanca, and Cauca. Among the principal deposits of Cauca are those of San Lorenzo, Yocoto, Coli, Pichinche and Andagueda. The principal mining districts of Colima are those of Anchique, Fiscal and Nacoroco, lying southwest of Natagaima. The International Colonizing

Company, of New York, has extensive concessions in this district, on which good bodies of copper ore have been located.

ECUADOR. While there are no working mines in this republic, the existence of copper ores at various points has long been known. One of the most recent and most important discoveries was made in 1900 in the province of Ahuay, about 35 miles from the coast, where a promising deposit of copper ore was discovered, at an elevation of about one mile above sea-level.

PARAGUAY. There are deposits of copper ore in the northern part of Paraguay, but details regarding the size, richness and probable value of the veins are not obtainable.

PERU. The rapidly growing copper industry of Peru suffered a rude shock in the decline of the metal's market price, and production fell off greatly during 1902. The very extensive operations put under way by the Cerro de Pasco company will result, within the next few years, in giving to Peru the largest and best equipped mining and smelting plant on the South American continent, and the example thus set is quite certain to have a highly beneficial effect on the Peruvian copper industry as a whole.

The Andean copper zone of Argentina, Chile and Bolivia is also found in Peru, and copper mines have been opened at a number of different points. According to the reports of the Minister de Fomento for 1900, there were 104 copper mines, an equal number of cupriferous silver mines and two mines of gold, silver and copper, within the boundaries of the republic. The government now has two surveying parties in the field, especially to delimit the copper-bearing districts, but their work will necessarily require a long time for completion. Mine owners furnish no reports to the government, and authenticated facts regarding the copper measures and copper mines of Peru are difficult to obtain from any source.

Peru was once a considerable producer of copper from various districts, but the industry fell into decay until late in the Nineteenth century, when there was a revival, stimulated by the high price of the metal. A limited amount of copper is produced as a by-product in the smelting of cupriferous silver ores. The principal mines of the republic are found in the four districts of Ica, Yauli, Acari and Cerro de Pasco, with minor properties in the districts of Mollendo, Moquega and Huarochiri.

The Ica district was once worked extensively, but was abandoned in 1892. Its largest mine is the Canza. The ores averaged about 30 per cent. copper, the lower grades being rejected. The drawbacks in this district are lack of water and good roads. The mines of Yauli, including the adjacent district of Morrococha, are located at an elevation of upwards of 13,000 feet above sea level. This field was once a considerable copper producer, but work was stopped for the same reason as in the Ica district. More or less silver is still mined, and some high grade copper ore averaging 26 per cent. in tenor is still being mined. The San Francisco is the principal mine of the Yauli

district. The Acari district in the province of Camana has a number of small mines, but there is little activity at present. In the other minor districts conditions are practically the same.

The Cerro de Pasco district has always been the principal field of Peruvian copper production, and with the work now under way by the American company will speedily assume a commanding position, not only in Peru, but in all of South America. This district has been worked in a desultory fashion for 300 years, but serious development along modern lines was begun as recently as 1897. The district occupies a basin in the Cordilleras, at an elevation of 14,000 feet, and is most difficult of access. Unlike the other Peruvian fields, which are arid, there is an excess of water at Cerro de Pasco. The ores that have been worked hitherto have ranged in tenor from 25 to 40 per cent. copper. The lower grade ores, of which there are large bodies, have remained untouched, or were discarded after mining, only the richest ores being able to pay for the heavy costs of refining and transportation. The freight rate, for transportation on the backs of mules and llamas, is \$40 per ton between the mines and Oroya, the terminus of the Meiggs railroad running from Callao into the Andes. The difficulty of getting out copper and getting in machinery and supplies, upon the backs of pack-animals, over the roughest of mountain trails, can only be understood by those that have had experience. The Cerro de Pasco company has secured control of the old Meiggs railroad, one of the engineering marvels of the world, and will continue the line to the mines from its present eastern terminus at Oroya. This extension was begun in the spring of 1901, and is proceeding uninterruptedly and successfully, though the problems to be met and overcome are certainly among the most stupendous ever attacked by courageous engineers. The expenditures of the company on the mines and railroad are already estimated at seven millions of dollars, and millions more must be devoted to the completion of the work. Fortunately there is no question of the ability of the company to raise any amount necessary.

URUGUAY. There is copper ore in Uruguay, but, so far as can be ascertained, there are no copper mines, and no serious attempt has ever been made at exploiting the copper deposits.

VENEZUELA. This country was once a considerable producer of copper, and is estimated to have made about 65,000 long tons of refined metal in the period 1872-1894, in which latter year the mines of the Aroa or Quebrada district were closed down. The principal cupriferous district of Venezuela is found on the Narvaez or Bolivar tract, between the Tocuyo river on the north and the Yaracuy on the south. This tract extends some 54 miles in an approximately east and west direction, comprising 1,150 square miles. These lands were granted to one Narvaez by the Spanish crown, in 1508, and in 1802 passed, by marriage, into the hands of Simon Bolivar, the liberator. This tract, on which a number of mines were opened, is now owned by a London syndicate. The mines of the Quebrada district, lying on the Aroa river, are included in the lands of this extensive estate. The igneous country rocks

are of slate and limestone, with various intrusive rocks. Copper is found in lenticular masses, frequently of considerable size and unknown depth, the series of lenses having a strike nearly north and south. The ores are oxides and carbonates at and near surface, followed at slight depth by iron sulphides.

There are traditions that these mines were worked by the Indians before the coming of the Spanish. Early in the Nineteenth century, a Baltimore company operated several of the mines, and secured about 43,000 tons of high-grade carbonate and oxide ores. Later on Venezuelan capitalists took the mines and removed about 100,000 tons of high and medium grade ores. The Quebrada district will doubtless be given attention at some future time, but just at present political conditions in Venezuela are not satisfactory, and the enlistment of foreign capital, absolutely necessary for the development of the mines, is rendered difficult by the complaints of ill-treatment made by European and American moneyed men who have invested large sums in various mining and land enterprises in this republic.

CHAPTER XI.

COPPER DEPOSITS OF EUROPE.

Brief descriptions of the principal copper measures and developments of Europe are given, under the names of the respective countries possessing cupriferous deposits and mines, in this chapter, the titles being arranged alphabetically.

AUSTRIA. The total annual production of refined copper by Austria is about 2,000,000 pounds. Copper has been mined and smelted for hundreds of years, but none of the mines now active are worked on a large scale, and the mining and metallurgical plants are by no means modern in design.

Copper deposits are found in various parts of the empire, and mines are worked in a small way at several points, the principal of which is Kitzbuehel, in the Tyrol. There are other Tyrolean mines, all of quite insignificant production, and a few small producers at Salzburg. The Graslitz mine, in Bohemia, was a very large producer during the middle ages, but was abandoned in the Eighteenth century.

BOSNIA. Copper ores are mined in a small way at several points in Bosnia. Ore is mined and smelted at Sinjako, while the ores from other points are sent, in limited quantities, to Hungary for reduction. Bosnia and Herzegovina, which are under the protection of Austria, are usually lumped with the dual monarchy of Austria-Hungary in figures of production. The output for 1901 was 237 tons of refined copper, made from 4,747 tons of ore, of which 1,040 tons were fahlerz.

BULGARIA. There is ample evidence that mines of copper were worked within the present limits of Bulgaria during the days of Roman dominion, and possibly in even earlier times. At Plakalnitza, in the department of Vratza, there are considerable slag-piles from ancient smelters, dating from a time so remote that no vestiges of the works themselves are to be found, and in other departments of the principality there are similar but smaller slag-piles and waste-burrows of refuse containing traces of lean ore, the values of which have been effectually leached out by the rains of two thousand years.

At Plakalnitza the ore is mainly bornite, with a little malachite and chalcopryite. At Kara Bair, near the port of Bourgos on the Black Sea, chalcopryite is found in considerable profusion, and copper mines were evidently worked there at some remote period. At Milkiovtzy in the district of Trn, there are small deposits of chalcopryite, chalcocite and malachite, in a barytic gangue. There is also chalcopryite at Belogradchik, where some work is now

being done. Chalcocite is found at Gornya-Banya and at other points in the department of Sofia, not far from the capital city, and in the districts of Sleven and Samokof native copper and oxide ores have been found.

CORSICA. There are a number of old copper mines in Corsica, of which one, the Lancone, was once a considerable producer.

CYPRUS. The Latin word *cuprum*, from which comes the English word copper, was derived from the name of this island, thus attesting its ancience as a source of copper. In ages long past there were extensive copper mines on the island, but the production at the present time is trivial, exports for 1899, the largest for some years, having been but 36 metric tons. One English corporation is now operating on the island.

ENGLAND. Copper and tin have been mined in Cornwall and Devon from very remote times, possibly for three thousand years. Oxide and carbonate ores occur in the conglomerates and sandstones of Cheshire, and these were once mined to some extent. Cumberland also had copper mines some centuries ago, and the Goldscope was England's most famous copper mine during the Tudor era, working a fabulously large force of men to get the very moderate amount of copper that was secured. During the first half of the Nineteenth century Cornwall and Devon were the world's largest producers of copper. The importance of England, as a source of copper supply, received a check from the development of the richer ores of Chile, and when Lake Superior, South Africa and Australia entered the field of production, the English output began to decline, until it now averages only about a million pounds yearly.

The copper ores of Cornwall and Devon, adjoining counties in the southwestern part of the island, are found in a clay-slate of the Devonian system having frequent bosses and veins of granite, with both slate and granite intruded by a quartz-porphyry. The veins are narrow, three feet being a liberal average, and are frequently capped with gossan, this capping being more common over the copper veins than above the veins carrying tin stuff. Veins of copper seem to favor the slates, while tin takes more kindly to the granite, but these observations hold true in a general way only, as there are many exceptions to the rule, while tin is frequent in copper mines, and copper is of common occurrence in the tin mines, and in places tin and copper alternate in occurrence. As a rule the richest portions of a mine are found where the veins have the sharpest dip. Native copper, while rarely found in quantities of commercial importance, is by no means uncommon, and is found in serpentine at the Lizard. One mass of native copper weighing three tons was secured from a mine near Mullion, Cornwall. The ores of copper are of many varieties, most of the more common sorts occurring, while many of the rarer copper minerals have been found, from time to time, in these two counties.

FAROE ISLANDS. Native copper, associated with mesotype, occurs disseminated in amygdaloid rock in these islands, but no attempt at mining has ever been made, so far as known.

FINLAND. Copper ore is found at several points in Finland, but the only active mines in the grand duchy are at Pitkaranta, where chalcopyrite in sahlite occurs in a granite country rock. These mines have been worked for many years and produce about one million pounds of refined copper annually.

FRANCE. The wealth of France is in her fertile soil, and not in her minerals. Copper ores are found at various points and a number of mines have been opened, but none of them ever proved either large or very profitable, and at present the production of copper from French mines is insignificant, having amounted to only 201 metric tons for the year 1900, the latest figures obtainable from the government bureau of mines. There are copper mines in the department of Var, Gard and Corse, also in Savoy and in the Basse-Pyrénées near the Spanish frontier. Argentiferous copper ore to the extent of 1,184 tons was exported to England in 1900 from the department of Ariège. In the same year 837 tons of iron-copper pyrites were exported to the same country, from the department of Corse, and 115 tons of copper ore were mined in the department of Gard.

GERMANY. The copper mines of Germany rank second in importance in Europe only to those of Spain and Portugal. The industry is one of considerable antiquity, and the history of the Mansfeld mines can readily be traced back to A. D. 1199, in which year the first copper was mined. The Mansfeld district, near Eisleben, in the Southern Harz mountains, is much the most important in the empire. In this district the ore is found in beds of the Permian system, resting unconformably on crystallized strata of Paleozoic rocks. The eldest of the Permian rocks is a sandstone of several hundred feet in thickness, superimposed upon which is a second sandstone of little depth, upon which, in turn, rests the celebrated "kupferschiefer," or copper-bearing shale, a clayey slate averaging but two or three feet in thickness, and carrying a disseminated sulphide ore returning an average of about 2.5 per cent. metallic copper. The upper sandstone lying next below the kupferschiefer is also copper-bearing to some extent, and is worked at times. The area of the kupferschiefer is very great, probably nearly 200 square miles, and a number of square miles have been worked out and many miles worked over in the seven hundred years that the mines have been in operation. The Mansfeld district is notable for the possession of coal for fuel and limestone for fluxing, in the rocks above the copper-bearing strata, and ore, fuel and flux are sometimes mined from the same shaft.

There are also copper-bearing measures of lesser importance at Goslar, in Prussian Saxony; at Rammelsberg, in Nassau, and still less important ore bodies at several other points in the empire.

HERZEGOVINA. The industrial statistics of this semi-independent little country are usually included with those of Bosnia in the figures of the dual monarchy of Austria-Hungary, as Bosnia and Herzegovina are under the protection of Austria, since the congress of Berlin in 1878. The joint production of copper by Bosnia and Herzegovina reached 237 tons in 1901. Operations

are carried on in a most primitive manner, at the few points where any copper mining is done.

HUNGARY. The kingdom of Hungary has about a dozen copper smelters, all small and none modern in design or practice. Copper is mined at a number of different points, the sulphide ores predominating, and the industry is one of great antiquity in this country, but has made comparatively little progress of late, the production remaining practically stationary. The principal mines are in the vicinity of Rezbanya and Dognacska, though even the largest mines are not big producers, and there are a number of small properties from which a few hundred tons of ore are extracted annually.

IRELAND. The copper production of Ireland is insignificant at present, averaging possibly 20 tons yearly, and is secured by cementation from the waters leaching from old mine openings. There are three copper districts in the island, these being the Wicklow, Waterford and Cork and Kerry fields. In the Avoca valley of Wicklow sulphide ores occur in clay slates, much as in Cornwall and Devon. The industry was once important and in 1799 the Connecree mines yielded 677 tons of refined copper, which was a big product for those days. The 1899 production was 17 tons, obtained by leaching and cementation.

In the vicinity of Knockmahon, in County Waterford, the ores are also sulphides in clay slates, and averaged about 10 per cent. copper when worked. In 1843 the output of finished copper was upwards of 900 tons. In the southern part of Cork and Kerry large mines were opened during the Eighteenth and early Nineteenth centuries, the Mountain and Keallonge mines each being more than a quarter mile in depth, while there were other considerable properties at Berehaven and Lackamore, and on Ross island. All these have been idle for some years.

ITALY. Copper was mined in Italy previous to the Christian era by the Romans, and before their day the metal had been extracted by the Etruscans. The industry has had its ebb and flow, but has never been entirely at a standstill, for more than two thousand years. There are a few mines with fairly modern equipments, but as a rule the properties are worked upon a somewhat narrow scale.

The principal copper districts of Italy are four in number, viz.: Volterrano, Grosseto, Liguria and the western Alpine region. The ores of the Volterrano district, mainly chalcopyrite, with a little chalcocite, are found in a red gabbro known locally as porfido rosso. This district has been the scene of copper mining operations from the earliest times of which authenticated records remain.

The Grosseto district is now producing considerable copper from ores occurring both as contact and fissure veins. The Val Castruccio, Bocchegiano, Montecatini and Capanne Vecchie are the principal mines of this district, and the principal mining center is Massa Maritima, the Massa Metallifera of Roman days.

The Ligurian mines lie near the coast of the Mediterranean, above Genoa. The copper ores are found in stratified azoic rocks, as contact veins lying between the diorite or serpentine and the metamorphic rocks, the gangue of the sulphide ores being quartzite.

In the Piedmont district mines were worked in Roman days, and traces of old workings are to be seen at many points. The ores occur in stratified archaic rocks, no fissure veins being found, and nickel and cobalt are frequently associated with the copper, the Calcante being a typical example of the copper-nickel mines of the district. A little native copper is found in some of the Italian mines. In 1900 there were 16 productive mines in the kingdom.

NORWAY. There are considerable deposits of copper ore in Norway, the principal district being near Trondhjem, where the sulphide ores lie in schists and slates of the lower Silurian system. Ores are also found in Telemarken in a granitic country rock, and copper ore is mined to a greater or less extent in the ams of Trondhjem, Stavanager, Nordland and Finmarken, the principal mines being in the Sulitjelma and Roros districts and in Stavanager and Tromsøe. A number of Norwegian copper mines lie to the northward of the Arctic circle. The production of copper from the mines of this kingdom is slowly increasing.

PORTUGAL. Much of what appears under the title of Spain applies to the copper deposits of Portugal as well, and to save needless repetition the reader is referred to the article on Spanish copper deposits in this chapter, for a general description of the cupriferous measures of the Sierra Morena, of which the mines of San Domingos and Grandola, in Portugal, form the western extension. The principal mining fields are the San Domingos, Grandola and Aljustral districts, with lesser properties developed in the Algarve and Aveiro districts. The San Domingos is much the most important mine of the kingdom.

Owing to the close propinquity of the Spanish and Portuguese copper districts, and the operation of mines in both kingdoms by the same English companies, the outputs of both countries are usually lumped in statistics of production. The Portuguese production in 1901 was equivalent to 9,933 metric tons.

ROUMANIA. There are copper deposits, apparently of importance, in this country. In the Carpathian Mountains chalcopyrite and carbonate ores are found at Valea Choboroasa, these assaying 7 per cent. cupric oxide, with a little gold. Samples of ore from Salishta gave 18 to 32 per cent. cupric oxide and 100 grams gold per ton. Carbonate ores have been found in promising quantities in the district of Dobroudja, at the towns of Balabancea, Islam-Geafer, Carapelit and at Altan-Tepe near Tcheamourli.

RUSSIA. There are extensive copper-bearing measures in the empire of Russia, those of Siberia being separately treated in the chapter on Asiatic copper deposits. As a rule the copper is found in rocks of the Permian system,

the name of which was taken from the heavy outcrops found in the government of Perm, where many of the principal Russian copper mines are located.

The principal mines of European Russia are in the governments of Perm, Elizabethpol, Orenburg, Kutais, Tiflis, Nijni Tagilsk and Viatka. Two of the three principal copper producing properties of the empire are in the government of Perm, and these make more than one-half of the Russian production. The Bogoslovski works turned out 72,961 poods of finished copper and the Rudianski works made 86,473 poods, in 1900. The Kargalinski works, in the government of Orenburg, made 18,849 poods in the same year. The governments of Perm and Orenburg are in the Ural Mountain region.

In the Caucasus region are the mines of the governments of Tiflis and Kutais. The largest producer is the Dzansulski, in the government of Kutais, with an output of about 14,000 poods. The Meriaski works, in the same government, made 4,544 poods in 1900, and the Alverdski and Shamblurgski works in the government of Tiflis produced 4,490 poods in 1900. The production of refined copper by the mines of the entire Russian empire, including Siberia and Finland, amounted to 7,534 metric tons, in 1899, the latest year for which official figures are available.

There are a number of old mines in the empire, of little productive importance at present, such as the Miednoroudiansk, in the government of Nijni Tagilsk, famous for its massive malachite, a single mass weighing 330 tons having been taken from this mine in 1836. The Kiadebek, or Kadabenski mine, in the Elizabethpol district, is operated by German capital, and is one of the most important mines of the empire, though no figures of production, other than mere estimates, are available for present use.

There are about thirty smelting plants for copper operated in the empire, including those in Siberia. Most of these are small and antiquated, though there are a few that are fairly modern. Judging from the immense extent of the copper-bearing measures, and the good grades of ore secured in the better mines, there is a future ahead of the Russian copper industry, much brighter than might be inferred from the limited development secured in the centuries that have elapsed since copper was first mined and smelted.

SCOTLAND. There are deposits of chalcopyrite in Perthshire, Kirkcudbrightshire, and at several other points in Scotland, but no copper mining is done.

SERVIA. Copper mines have been operated, on a limited scale for many centuries in Servia. There are old mines and a few active properties at a number of points, but the principal copper producers are in the vicinity of Majdanpec. The production of refined copper from Servian mines was 270 metric tons in 1900.

SPAIN. The kingdom of Spain possesses great mineral wealth, and in the value of its copper and iron measures leads all the other countries of Europe. Copper ores are found in Huelva, Alicante, Almeria, Asturias, Badajoz, Barcelona, Burgos, Caceres, Castellon, Coruña, Cuenca, Gerona,

Granada, Guadalajara, Huesca, Jaen, Leon, Lerida, Logrono, Madrid, Malaga, Minorca, Navarra, Palencia, Santander, Segovia, Sevilla, Taragona, and Teruel, and in all of these copper mines have been opened. Mining is being done at present in a number of these provinces, but the preponderating production of the kingdom comes from the mines of Huelva. This district is in the Sierra Morena of the province of Huelva in southwestern Spain, and the cupriferous formation continues into the adjoining kingdom of Portugal. This district is said to be some 30 miles wide by 150 in length, extending from Aznalcollar in Sevilla to San Domingos in Portugal, but the limits of the demonstratedly profitable zone are much more circumscribed. The Sierra Morena, or Andevallo cupriferous belt as a whole, is divided into four zones. The eastern zone includes the Cerro Muriano and other mines near Sevilla, while the western zone is in Portugal, with the village of Grandola as an approximate center. The northern zone includes the principal mines of both Spain and Portugal, while the leading mines of the southern zone are the Tharsis, Castillo del Buitron, Lagunazo and Las Herrerias. All of these zones present the same general characteristics, having lenticular masses of ore that parallel the layers of slate and the strike of the veins in the porphyry. The ore bodies are of varying size, sometimes of immense dimensions, the largest reaching a length of nearly 4,000 feet and an extreme width of 500 feet. These lenses are usually found at the junction of slate and porphyry. The slates are of the Paleozoic group and probably of the lower Carboniferous system. Their strike is northwesterly, and dip to the north. These slates are of a yellowish tinge at surface, where weathered, but bluish at a little depth. The slates have been intruded by porphyry, syenite and diabase, the porphyries occurring in a succession of parallel lenses with the same strike as the slates. The ore bodies are also parallel with the slates and porphyries, and may be considered true contact veins.

The ore bodies, below the shallow alteration zone at surface, are formed of an intimate mixture of chalcopyrite and pyrite, giving a disseminated sulphide ore of copper averaging 3 to 4 per cent. metal, though considerable ore of higher grade is encountered. The ores are slightly argentiferous and auriferous, and under the highly perfected processes of extraction now employed, the values of the precious metals are quite closely extracted, and small as is their percentage this saving amounts in the aggregate to large sums, owing to the immense tonnage of ore treated annually. A strong tendency is noticed in the lower levels opened in these immense lenses toward decreased dimensions and lessened values.

References to the interesting metallurgical processes employed in the Hispano-Portuguese mines will be found in the chapter on metallurgy, and more detailed references to the geology of the various important mines will be found in the descriptions of the principal mines of Spain and Portugal.

The first copper mining in the Iberian peninsula was done, in all likelihood, by the Phœnicians, some 3,000 years ago, and was continued by the Carthaginians. The Romans succeeded to the dominion of the peninsula, and extensive traces of their work are yet to be found in the Sierra Morena.

Mine timbers, which in all likelihood were put in by Roman workmen nearly or quite two thousand years ago, are still in place, effectually protected from the gnawing tooth of time by the preservative action of the copper sulphate with which the mine waters are liberally charged. The modern era of Spanish copper production dates from 1860, when the Tharsis mine—the Tharsish of the ancients—was reopened. The Rio Tinto was reopened as recently as 1876.

SWEDEN. Copper has been mined in Sweden for more than 600 years, from the famous mines of Falun. The ore at this point is chalcopyrite occurring in connection with iron pyrites, and is found in lenses of considerable size. The Storra Kopparberg mine, near Falun, is the best-known property of the district, and furnishes much of the copper, some of the silver and most of the gold produced in the kingdom. Copper ores are found in the läns of Östergötland, Malmöhus, Örebro, Vestmanland and Kopparberg. There are mines in all of these districts, most of which are small producers or entirely idle. There are three smelters in Sweden, of which the most important is at Atvidaberg. In addition to the metal produced from direct smelting, a little copper is produced at Helsingborg by superphosphate works which extract the copper from the cupriforous iron pyrites residues, producing about 120 tons of cement copper annually. About 550 tons of blister copper is turned out from the smelters at Atvidaberg, Falun and Kafvelstorp, the copper production of the kingdom being insufficient to supply the domestic demand.

TURKEY. Extensive copper deposits exist at several points in the Balkans, on both the Bulgarian and Turkish sides of the mountains. The present copper production of Turkey is probably 3,000 to 4,000 metric tons yearly, of which amount the exports are about 2,500 tons, but these figures are estimates, except in the case of exports. Of exports of approximately 2,400 metric tons made in 1900, the mines and smelters of Arghana Maden sent about 1,400 tons, while about 1,000 tons came from Bakir Maden, near Diarbekir, Asiatic Turkey. The mines at Tokat were once considerable producers, but have fallen off latterly. Copper has been mined and smelted for some centuries near Kharpur, and has been produced to a considerable extent by the mines of Kalabak, near Mount Ida, from time immemorial, having been ancient in the time of Strabo, who describes them. The ore at this point is chalcopyrite occurring in slates and limestones said to be of the Tertiary period.

WALES. The copper mines of Anglesea were worked by the Romans, and possibly by the Phoenicians before them. There were also considerable mines in Merionethshire, and up to about 1830 Wales was a considerable producer. At present the only copper production is a score of two tons produced yearly as cement copper from the water leaching out of the old Parys and Mona mines.

CHAPTER XII.

COPPER DEPOSITS OF AFRICA.

There are important developments in copper mining at several African points, and it is probable that the Dark Continent will become a much larger producer in the future than it ever has been in the past. The deposits and developments of this continent are treated alphabetically.

ABYSSINIA. The mineral wealth of Abyssinia is largely a matter of conjecture, but it is certain that copper exists at various points. The Negus Menelik, emperor of Abyssinia, has evidenced progressive tendencies since the Italian invasion of his country was repulsed and has encouraged foreign capital. It has been stated in press dispatches, published late in 1902, that mining and railroad concessions are being revoked, but the news has not been confirmed. Abyssinia is a mountainous country, lacking railroads or good wagon roads, and the development of copper mines is apt to await the securing of better transportation facilities.

ALGERIA. Chalcopyrite and antimonial gray copper ore (tetrahedrite) are the principal copper ores of Algeria. The gray copper found in Kabylia is somewhat argentiferous, and occurs in rocks of Jurassic age. The Am Barbar mine, in the department of Constantine, near the Tunisian frontier, has a rather remarkable lense of sulphide ore averaging 8 to 15 per cent. copper, absolutely isolated and enclosed in Ligurian schists. The copper is associated with galena and zinc blende. Along the Mediterranean coast, in the department of Constantine, there are a number of small veins, of no great depth, carrying sulphide ores, in a gangue of quartz. There are several mines of antimonial ores carrying more or less silver in the department of Alger, but none of them are worked at present.

ANGOLA. The existence of sulphide and carbonate ores, in considerable abundance, is reported from various points in Angola, but, so far as known, none of them have been opened, and no attempts at development are contemplated at present.

ASHANTI. The occurrence of native copper, apparently in dendritic forms, in the country several days' journey back from the Ivory Coast of Ashanti, is reported to me by Mr. John Nolan, of Sekondi, Ashanti, who is in charge of diamond drill explorations for gold, conducted by sundry English corporations.

BASUTOLAND. According to Sir Godfrey Lagden there are indications of copper, tin and iron in Basutoland.

CAPE COLONY. The copper production of Cape Colony comes exclusively from Namaqualand, on the west coast, the productive area lying in Little Namaqualand, about 90 miles from the Atlantic. All copper ore shipments are made through Port Nolloth, which ranks fourth in exports in this colony. There are two large companies operating in this district, and the first production was secured in 1852, since which time copper has been exported to the value of nearly \$60,000,000.

The ore is chiefly chalcopyrite, returning an average of 17 to 19 per cent. in smelting, these figures making it evident that considerable care is exercised in selection. The country rock is granitic, and the ore occurs in lenses, often of great size. The largest mine is the Ookiep, which is partly exhausted. Little Namaqualand has apparently been a decadent district for some years, but recent explorations have shown promising deposits for future exploitation. It is now purposed building a new railroad, which should prove a considerable stimulus to the development of new mines.

CONGO FREE STATE. The existence of copper ore deposits, some of which are apparently of workable size and richness, has been known for years, but no mining worthy of the name has ever been done. The natives of the upper Congo dig a little iron and copper ore and smelt them with charcoal in pits, for the making of weapons and utensils. At Katanga there are several workable deposits, the ore occurring as lenses in schistose sandstones. At Mboko-Songo a few small mines have been opened in limestone. Ore has also been found in Yambingo, at Manyanga, and near the western shore of Lake Albert Nyanza.

FRENCH CONGO. Copper ore exists at several points in this colony and at least one mine is now in process of development, in the vicinity of Brazzaville.

GERMAN EAST AFRICA. The existence of copper in this protectorate has been reported, from time to time, but, so far as can be ascertained, no efforts have ever been made to develop regular mines on any of the deposits located.

GERMAN SOUTHWEST AFRICA. Copper ore has been found in this protectorate between the Swakab and Knisib rivers, and a mine is being developed at Windhoek by the Damaraland Copper Syndicate, Ltd.

GERMAN WEST AFRICA. It is reported to the German Colonial office that ores of copper, gold, silver and lead have been found in abundance at a spot about 400 miles inland from Walfisch Bay.

GOLD COAST OF AFRICA. The ores of a variety of valuable metals, including those of copper, have been found at various points in the interior of the Gold Coast of West Africa, but no attempt has been made at developing copper mines.

MADAGASCAR. Very little has been done as yet, either by the French government or private capital, for the development of the copper resources

of the great African island of Madagascar, although the copper measures already known would seem to warrant exploitation, or, at least, careful government inspection by trained scientists. There are native mines, worked in a crude way by the Hovas, at Ambataofaugehana in the district of Ambositra and at Vohinana. In this district there are two mountain caps, between which are extensive mica-schists of several miles in length. The ore is principally malachite, averaging 10 to 45 per cent. copper, and has sometimes been found carrying higher percentages. These mines are apparently about worked out. Other native mines are reported from the Betafo country. In this district of Imerinarive in the Cercle de Tsiafahy native copper has been found. The metal has also been found in virgin form in the district of Vonizongo. The country about Lake Kinkony in the Cercle of Mahavavy has long been reported rich in copper. According to some rather indefinite reports traces of copper have been discovered recently in the province of Vohemar.

MOROCCO. Though only three hours from Europe, Morocco is almost as effectively closed to civilization as though it were in the center of the Dark Continent. The country is reported to be rich in copper, as well as other minerals, but the sciences of statistics, geology and mineralogy have yet to be discovered in Morocco. Copper ore is found not far from Tangier, and was being mined and smelted, circa 1860, near Tarudant, capital of the province of Sus. This seems the latest authentic information to be had upon the copper deposits and industry of this kingdom.

NATAL. Copper ores exist in this colony, but little has been done in the way of exploration and no mines have been developed. The value of the discoveries made is largely a matter of conjecture.

NYASSALAND. The ores of copper, nickel and zinc have been discovered in Portuguese Nyassaland, but no attempts at mining have yet been made in the case of the copper ores.

RHODESIA. Prospecting for copper has been in progress for several years, and while Rhodesia has not gotten to the productive stage, there are good indications of payable copper mines being secured in the Lomagundi, Umtali and Victoria districts, and development work is now in progress in all of these districts, while copper ores have also been found in the Melselter district. Several strong British corporations are now at work in different parts of the colony, and thorough tests of the value of Rhodesian copper measures are quite certain to be secured.

Much the most important and most extensive development work is under way in the Victoria district, where copper has been found, apparently in large quantities, near the Kufekere river, a short distance north of the Victoria Falls of the Zambesi river. These falls are of immense height and volume, and are to be harnessed by the South Africa Chartered Company, which has engaged the services of Sir Douglass Fox and Sir Charles Metcalf as expert electrical engineers for devising the works, which, in all likelihood,

will be modeled quite closely along the lines of the immense electrical power installation at Niagara Falls. The plans of the company are drawn upon a most ambitious scale, and include the generation of sufficient power to operate not only the mines, but also a railroad line from the falls to the mines, and possibly also a railroad to the coal fields about 150 miles distant.

SENEGAL. Copper ores occur in the vicinity of the Senegal river, but details are lacking.

SUDAN. The only producing copper mine in the Anglo-Egyptian Sudan is the Hofret-el-Nahas, in southwest Kordofan, and this, owing to lack of adequate transportation, is worked solely for local consumption, mining and smelting being upon a primitive scale. Prospecting is now being done in various parts of the Sudan, but no copper has been found as yet, though there is thought to be copper in the Suakin district.

TRANSVAAL. Copper ore was discovered in this colony near Rustenberg, just previous to the outbreak of the Anglo-Boer war. The discovery is said to possess sufficient merit to warrant further attention.

UGANDA PROTECTORATE. Copper is vaguely reported from Uganda, somewhere between Lake Victoria Nyanza and the Nile, but precise information as to these discoveries seems lacking.

ZULULAND. Sulphide and silicate ores of copper have been discovered near the Insuzi and Umhlatuzi rivers, in the Nkandhla district of Zululand. Apparently no attempts have been made to prove the possible value of these ore bodies, which are some distance from transportation lines.

CHAPTER XIII.

COPPER DEPOSITS OF ASIA.

As in the preceding chapters, the copper deposits of Asia are treated alphabetically, by countries.

AFGHANISTAN. The northern part of this country is said by travelers and natives to be rich in copper. Owing to the peculiar political position of the country, which is a buffer state between British and Russian possessions, industrial progress meets with discouraging obstacles. The development of modern copper mines demands railroads, and it is not probable that Great Britain would look with favoring eyes on railroad construction, as such lines would afford an advantage to Russia in case the latter country desired to invade India. The Russians, however, are pushing a transcontinental railway in the direction of northern Afghanistan, and this may lead, when completed, to the development of mineral resources now latent.

ANNAM. There are deposits of copper ore in the province of Quang-Nam, Annam, but detailed information as to the character and extent of the ores has not been secured for the present issue of this work.

ARABIA. There are deposits of copper ore near the shores of the Red Sea in Arabia Petrea, and a number of old mines are found on the slopes of Mt. Sinai. These mines, which yield turquoises as well as ore, were evidently never rich in metal. It is probable that they were the first copper mines ever opened, and the date of the first mining is probably as remote as 5000 B. C. The mines were the property of various nations, from time to time, and were the cause of various wars between the races coveting them, but were held mainly by the Egyptians. It is probable that after being worked for more than three thousand years they were finally abandoned before Moses led the children of Israel out of Egypt. The scepter of Pepi I, a Pharaoh of the Sixth dynasty, now preserved in the British Museum, is made of pure copper, and probably came from the mines of Mt. Sinai. The ore is chrysocolla in porphyry, and the ruined furnaces and slag piles found near the old adits, still open, show that the ore was smelted at the mines. Analyses of the slags do not show the use of fluxes in the reduction of the ores.

CHINA. Copper is of quite general occurrence in China, but owing to the lack of authentic records accessible to investigators from countries of better industrial development, details regarding many of the provinces are lacking. Copper mines have been worked for many centuries under

the most primitive methods of mining and smelting. The production of the empire is estimated at five million pounds annually, all of which is consumed in China.

Among the more important properties are those of the province of Yun-Nan, in southern China, where sulphide veins occur in limestone and sandstone strata near intrusive igneous rocks. The ore is both auriferous and argentiferous. Native metal is also found sparingly, in grains and small masses. The principal production of the empire is from this province, estimated at about 3,000,000 pounds yearly, of which upwards of 2,000,000 pounds are exported to other provinces. Kwei-Chau, also in southern China, produces a limited amount of copper, from ore bodies resembling those of Yun-Nan. There are also a few mines operated in primitive manner, with small production, at San-Kia-Tschang in the province of Ho-Nan, and a little mining is done in the province of Sze-Chuan.

The most modern copper mines and smelters are in Manchuria, and a new and well-equipped reduction plant has recently been completed at Kaya. With the industrial awakening of China, certain to come during the first quarter of the present century, the mineral resources of this vast empire will receive adequate attention, and while the immediate future holds out no promise of great mines, these will come in time.

COCHIN-CHINA. The existence of copper deposits, apparently of importance, is known in Cochin-China, but no mines are worked.

INDIA. Before the beginning of authentic history copper was mined and smelted in India, the production being secured along the simplest possible lines of digging and reduction. India was a considerable producer of the metal during the middle ages, and up to the beginning of the Nineteenth century, after which the output fell off slowly. During the Eighteenth century India shipped large quantities of copper to Europe, but the current was reversed later. The last active copper mining upon a considerable scale was done at Baragunda, from 1887 to 1891, but the chalcopyrite ore returned only 1 to 3 per cent. copper, and this was insufficient to permit a profit. A few tons of copper ore are still mined every year, and there are ore measures that will doubtless receive attention at some future time.

JAPAN. According to carefully-kept Japanese annals, copper was discovered about the beginning of the Eighth century. Mining and smelting were of the most primitive sort, the ore being reduced in clay pits, with charcoal for fuel. The first exports, other than to China, were made in the Seventeenth century, when Holland had a monopoly of Japanese trade, and copper was exported annually to the extent of 700 to 1,200 tons for many years.

After the opening of Japanese ports by Commodore Perry, in 1854, the Japanese were quick to realize the advantages of foreign technics and training. All branches of industry have been revolutionized in the past fifty years, and in no trade has greater progress been made than in the mining

and smelting of copper. Modern hoists and pumps, air compressors and power-drills, high explosives and other latest aids to mining have been applied, and Japan now has several strictly modern smelters. It must not be inferred that all Japanese copper mines are well equipped and operated in full accordance with the latest practice, for many of the mines are but little improved from the methods in vogue two hundred years ago, but the bulk of the production is secured under advantageous conditions, with excellent machinery, and under the direction of highly-trained engineers and metallurgists. Japanese mining men visit all of the important copper-producing fields of the world, and their practice ranks deservedly high.

Japanese copper ores are almost exclusively sulphides, and there are mines in nearly every province, though half of the 300 copper mines of the empire are idle, and there are but fifty mines or so that make fifty tons or more of refined metal yearly, while the bulk of the Japanese production comes from two groups of mines, the Ashio and the Besshi. Most of the copper ores carry silver, usually in quantities of commercial importance, while several mines have gold-copper ores, the gold values running as high as five ounces per ton in the selected ores of one mine. A little native copper is also found, as well as oxidized ores in limited quantities.

According to the latest available official figures, of date Jan. 1, 1900, the area covered by Japanese copper mines is 54,618,045 tsubo, a tsubo equalling 36 square feet, and mines covering 29,114,697 tsubo, or a little more than half the total area, were in operation. In addition, there were several mines of compound metals, from which a limited amount of copper was secured as a by-product.

The production of refined copper increased from 33,180,250 kin in 1894 to 40,459,709 kin in 1899, a kin being nearly equal to $1\frac{1}{2}$ pounds avordupois.

The most prominent figures in the Japanese copper industry are Messrs. Ichibei Furukawa of Tokyo, owner of the Ashio group, and Kichizayemon Sumitomo of Osaka, proprietor of the Besshi mines. Both have done much to modernize copper production in Japan, and to them their country owes a debt of gratitude for the breadth of view that led them, though gentlemen of the old school, to adopt the most modern improvements in their works, thus setting an example of great value as well as providing one of the most valuable exports of the empire.

KOREA. Copper ores are said to abound in this hermit kingdom, but details are scanty. A start has been made at gold mining with modern machinery and methods, and something will doubtless be done later with some of the more promising deposits of copper.

PERSIA. This country has long been known to be rich in copper, and there are mines, so called, in nearly every province, many of them very old. The methods of mining and smelting are of the crudest, and the production is necessarily small, being merely sufficient for the limited demands of the country itself. Until there are better railroad communications and foreign

capital can be enlisted in such enterprises but little will be heard from the copper mines of Persia.

SIBERIA. Copper deposits have been located at a number of points in Siberia, and a little mining has been done in several districts. The only mining of any importance now in progress is at Semipalitinsk, where the Pavovski mines and smelters turn out upwards of a million pounds of refined copper annually. The government of Semipalitinsk is rich in mineral resources, including coal and iron, and a large number of copper mining claims were located in 1900 and 1901, on few of which anything of importance has been done. The Akmolinsk district has received some attention from prospectors, and upwards of 100 copper claims have been registered in the Karakalinsk district. The value of these districts, judged by surface indications, is said to be considerable, but actual mining will be required to determine the true status of the new fields.

TONQUIN. There are copper mines, operated by natives on very crude principles, in the provinces of Sontay, Langson and Laokay, and the ores are said to be of good grade, although the production is necessarily small, owing to lack of modern machinery and methods.

TURKESTAN. There is one small mine, the Karankulski, in the Tashkent district of Turkestan, and there are other unworked ore bodies, some of which are apparently worthy of exploitation.

CHAPTER XIV.

COPPER DEPOSITS OF AUSTRALIA AND OCEANICA.

In this division of the earth the more important copper deposits and mines are developed in the commonwealth of Australasia, though there are beds of copper ore in New Caledonia and elsewhere that give promise of making good mines. The political divisions of Australia, Tasmania and New Zealand are first treated, after which references are made to the other islands in alphabetical order.

AUSTRALIA. The first copper shipment from this island continent was made in 1843, from South Australia, thus antedating the first production of Lake Superior mines by one year. The ores of Australian mines are principally sulphides, though rich carbonates are found at the Blinman mine and elsewhere, while native copper occurs at many points. The copper production of the commonwealth of Australia comes mainly from Tasmania, New South Wales and South Australia following, with 18 or 20 per cent. of the total product each, and Western Australia and Queensland bringing up the rear. More detailed references to the various states of the commonwealth are given under the titles of each, in the following brief articles.

NEW SOUTH WALES. The Great Cobar mine was opened in 1869, and was the first real copper mine of the state, though attempts at copper mining were made as early as 1847. A considerable number of copper mines, mostly shallow and with small development, have been opened at various points, from time to time. The Cobar district, in the western part of the state, is much the most important, and the Great Cobar mine produces the bulk of the copper output. The country rock of this district is mainly slates of the Silurian system, with few eruptive rocks—a rather unusual home for copper. There is also a cupriferous district in the central part of the state, where eruptive rocks predominate, and there are a number of scattering mines along the coast.

QUEENSLAND. This state was at one time a regular copper producer in a small way, but the industry fell upon evil times when the price of copper went down in 1889, after which copper production and development were at a low ebb until about 1898, when there was a great revival. The older copper fields were at Peak Downs, Cloncurry and Mt. Perry. At Peak Downs native copper was mined from amygdaloid trap, under conditions greatly resembling those governing in the Lake Superior copper district. Lack of transportation facilities caused the suspension of work. The Australian

Copper Company was once a considerable producer from the Cloncurry district, but high transportation charges caused the abandonment of that field also.

In the Mt. Perry district there is considerable activity, several strong mining companies being now at work. The Queensland railroad affords good transport, and there are smelters at the mines. The country rock is granite, and the veins are mineralized only for a portion of their width, the rich zones of mineralization rarely averaging a foot in width. Ore values have disappeared with depth in some cases, but in one instance remain unimpaired to a depth of 800 feet. The ores are highly silicious, but it is purposed using the auriferous and argentiferous gossan for a flux, which should kill two birds with one stone.

The Chillagoe district of the Herberton field has ores in carboniferous limestone, the geological conditions being comparable with those of certain Arizona districts. The existence of ore deposits without regular walls, forming a stockwerk, is a typical feature of this district. Development has been hampered by lack of adequate transportation facilities, but this will be remedied by the completion of the Chillagoe railroad, an ambitious undertaking designed to aid in the development of the mineral wealth of a large part of Queensland hitherto inaccessible. A big water power at Barron Falls is available for use at the Chillagoe mines.

There is also considerable activity in the Mt. Garnet district, though something of a chill has been caused by the drop in the price of copper in 1901. A number of small mines have been opened in the Stanthorpe district. These are said to be of promise. Undeveloped copper deposits are also known to exist in the neighborhood of Rockhampton and Gladstone, at Ravenswood, near Cardwell and to the west of Townsville, also, at other points on the eastern watershed.

SOUTH AUSTRALIA. The Kapunda mine was first opened in 1842, a decade before the discovery of gold, and in 1845 the Burra Burra began production. Since that time South Australia has been a regular though not altogether steady producer of copper, and it seems probable that the present annual output of five to six thousand tons is far less than this state is capable of producing. The Moonta was opened in 1863 and later consolidated with the Wallaroo, 10 miles distant. This consolidated property is now the chief producer of South Australia. The first smelter was built at Port Adelaide in 1851, and the second at Wallaroo ten years later.

On the Yorke Peninsula, where the Wallaroo and Moonta mines are opened, the country rock is porphyry, and the ores are principally sulphides, with oxidized ores, including a considerable percentage of atacamite, in the upper parts. A barren zone of 50 to 125 feet lies between the oxidized ores and the unaltered sulphides, though the veins continue regularly, but are filled with gangue rock only.

In the Kapunda district, 50 miles north of Adelaide, where the first mining was done 60 years ago, the ores are oxides and carbonates, with some

native copper. In the Burra Burra district, about 100 miles northeast of Adelaide, the country rock is limestone and shale, with very irregular deposits of rich altered ores, more regularity in vein formation being noted at considerable depth. Many mines have been opened in South Australia during the past 60 years, but only a few of them have been developed in more than the most rudimentary manner.

VICTORIA. The existence of copper deposits at various points in Victoria has long been a matter of common knowledge, but for some reason no serious mining has been done. The most notable field is in the Beechworth district, where outcroppings of copper ore have been found at a number of points in an area of about fifty square miles.

WESTERN AUSTRALIA. This state is noted for its large and profitable gold mines, but copper mining is not in a very advanced stage, although the first mine was opened as long ago as 1855. The total production to date is slightly under 15,000 tons, and the current rate of production is less than 1,000 tons per year. The principal development is in the Mt. Malcolm district, where the ore is matted in water-jacket furnaces at the mines. In other districts the ore is hand-dressed for shipment to distant smelters, and of course only the richer altered ores can pay for hand-work and high carriage charges.

Other principal cupriferous districts of Western Australia are the West Pilbarra, Murchison, Northampton, Mt. Margaret, Phillips River, Ashburton and Champion Bay. In the West Pilbarra district the country rock is a schistose slate, the copper occurring in a compact intrusive rock of igneous origin. The ore, chiefly carbonates and oxides of high grade, is secured by quarrying. In the Northampton district, the cupriferous belt is said to reach from the Irwin river on the south to the Murchison river on the north, and to carry rich copper carbonates, as well as lead ores. The Ashburton is a new district, in which a number of leases have been granted, but development work is so slight that little seems known beyond the assured existence of copper ore. The Phillips River district carries silicious gold ores, and ferruginous copper ores, the latter apparently in considerable quantities. The ores are mainly malachite and chalcocite, and are of high value, average assays running 31.48 per cent. copper, 2.16 oz. silver, and 0.15 oz. gold per ton. Taken all in all, it may be said that while Western Australia has been but scratched for copper, the results indicate the existence of several districts of distinctly above the average promise. The drawbacks are scant water supply and lack of railroads, but these can be overcome by a judicious combination of capital, time and skill.

TASMANIA. The copper mining industry of this island has had a rapid growth. The Mt. Lyell mine begun production in 1896, and a large number of new mines were projected in the immediate vicinity. The promoters of these properties displayed a most lamentable paucity of imagination, or else a strong desire to profit by the name of the first successful mine of the dis-

CHAPTER XV.

COPPER MINES OF THE WORLD.

As in the two preceding annual editions of this work, the detailed descriptions of copper mines and companies, given in this chapter, are printed in alphabetical order, regardless of location. This plan has some obvious disadvantages, but, upon the whole, is found the best of any tried or suggested, as it renders the work fully self-indexing. In actual practice the plan is not so easy to enforce as might be assumed, owing to the large number of duplicate names, and for various other reasons. In the case of the Copper Kings it was found necessary, in order not to confuse the reader beyond hope of recovery, to file in geographical alphabetical order. The definite articles have been omitted from all titles in English and German, but could not well be omitted from Spanish and French titles. In cases where the Spanish or French articles are used, the description has been filed upon the name of the mine rather than the article, but in the case of American or English companies having Spanish titles the filing has been done upon the article, whether La, Las, Los or El. The plan of indexing followed may strike the reader as cumbersome and awkward, but the difficulties encountered in dealing with titles in a dozen different languages, each with its own individual idioms, have been by no means inconsiderable.

AAMDAL COPPER MINES SYNDICATE, LTD.**NORWAY.**

Property, the Aamdal mine, at Mo, Bratsbergamt, Norway, sold to Tharsis Sulphur & Copper Co., Ltd.

ABBEY MINING CO.**NEW MEXICO.**

Office: 812 Park Bldg., Pittsburg, Pa. Mine office: Socorro, Socorro Co., N. M. Organized December, 1901, under laws of New Mexico, with capitalization \$1,000,000, shares \$1 par. Nelson Weddle, Jr., president; Earl A. Wheeler, vice-president; H. A. Spangler, treasurer; F. S. Tewksbury, recording secretary; J. F. Hinckley, financial secretary; Nathan Hall, general manager. Lands, 39 claims, area 780 acres, in five groups. The original group of 12 claims, known as the Abbey, is 22 miles north of Magdalena, Socorro county, showing two parallel veins, with about 600' of development work, now idle because of heavy inflow of water at depth of 100', carrying ores assaying up to 40% copper and 80 oz. silver per ton. The Washington group of 7 claims, 10 miles west of Upham, has a 165' shaft. The Lead group of 3 claims shows silver-lead ores. The Manganese group, near Rincon,

shows high-grade manganese ores, unavailable for mining until given rail connections now lacking. The Little Baldy group of 6 claims, in the Magdalena mountains, 6 miles from Water Canyon, is the site of the company's present development work, by a 900' tunnel on a vein of 13' to 28' width, paralleled by a quartzite dyke of 400' to 700' width giving assays of \$3 to \$5 gold per ton. Company is managed by men of good standing.

ABBOT CREEK GOLD & COPPER MINING CO. NORTH CAROLINA.

Office: care of W. J. Brent, Portsmouth, Va. Lands are in Lexington county, N. C. Main shaft 80', in vein giving average assay values of \$15 per ton in copper and gold. Has concentrator and mill with Tremain stamps and crusher.

ABERDEEN COPPER CO.

NEW MEXICO.

Office: 44 New St., New York, N. Y. Mine office: Lordsburg, Grant Co., N. M. Capitalization, \$1,000,000, shares \$25 par. M. F. Nagle, president; Frank W. Daniell, general manager. Lands, 52 claims, area 1,145 acres, in the Virginia district, showing 10 fissure veins, of which 7, averaging 5' width, are more or less developed, giving sulphide ore assaying 7% copper, 10 oz. silver and \$2 gold per ton, with considerable lead values, and are opened by 8 shafts with about 3,000' of underground openings. Has steam power, air compressor and 50-ton concentrator. A small smelter has been built on the company's lands by the National Smelting & Refining Company. R. Horton Batchelor, secretary of the company has been arrested for embezzlement. Company paid one dividend of \$32,175, which came from sale of treasury stock and not from earnings. One John Mapes, of Shamokin, Pa., was also connected with the property. Property is considered promising if given proper development, adequate capital and honest management, but company seems hopelessly mired.

ACARI COPPER MINING SYNDICATE, LTD.

PERU.

Has idle mines in the Acari district of the province of Camafia, Peru.

ACCIDENTAL MINING & MILLING CO.

COLORADO.

Mine office: Granite, Chaffee Co., Colo. C. Tyron, superintendent. Ores carry gold, silver, lead and copper. Has steam power.

ACME GOLD & COPPER MINING CO.

COLORADO.

Mine office: Gold Hill, Larimer Co., Colo. Lands, 12 claims, with 165' shaft and 200' tunnel. Has an 8-stamp mill.

ADA COPPER MINING CO.

MONTANA.

Mine office: Basin, Jefferson Co., Mont. Organized 1904, under laws of Montana. H. L. Frank, president. Property is the Ada mine and sundry adjoining claims carrying gold, silver and copper. Employs about 20 men.

ADAKAI MINE.

JAPAN.

Mine office: Adakai-mura, Yatsuka-gori, Izumo, Japan. Country rocks are Tertiary shale and sandstone, alternating. Principal vein strikes N. N. E. Ores are bornite, chalcopryite and pyrrhotite, accompanied by native copper and sphalerite, with clay gouge.

ADAMS COPPER CO.

WYOMING.

Mine office: Saratoga, Carbon Co., Wyo. W. S. Adams, superintendent.

ADAMS COPPER MINING & REDUCTION CO. - COLORADO.

Office: 513 Cooper Blk., Denver, Colo. Capitalization \$800,000, shares \$1 par. Lands, 7 claims, in Larimer Co., Colo. Copper Coin mine has a 200' shaft, with steam plant, showing about 4' of copper ore assaying \$47.50 per ton in value on the 200' level. Company is said to be in good shape financially.

ADDIE COPPER MINING CO.

Letter returned unclaimed from former address in Denver.

ADELAIDE STAR MINES, LTD. NEVADA.

Offices; 33, Renfield St., Glasgow, Scotland. Mine office: Golconda, Humboldt Co., Nev. P. Coats, chairman; G. Cuthbert, secretary pro tem; Glasgow & Western Exploration Co., Ltd., general managers; Otto Stallman, superintendent; J. Farren, mine superintendent. Capital, £350,000. Lands, 319 acres, including the Adelaide mine in the Humboldt district, and the Star mine in White Pine county, also a 170-acre millsite. Owns a 12-mile railroad from mines to Golconda. Ores carry copper, gold and silver. Has steam power and a reduction plant at Golconda that is said to have cost about \$200,000. Idle since 1901 and property for sale.

ADIRONDACK MINE. MONTANA.

Office and mine: Butte, Silver Bow Co., Mont. Jas. Murray, owner. Operated under lease by Conroy & Co. Has steam power. Main shaft about 500' deep.

ADMIRAL MINE. WYOMING.

Supposed to be located in vicinity of Encampment, Carbon Co., Wyo.

ADMIRAL GOLD & COPPER MINING CO. NEW MEXICO.

Office: Sterling, Kansas. Mine office: Tusas, Rio Arriba Co., N. M. Organized 1900, under laws of New Mexico, with capitalization \$500,000, shares \$1 par. C. A. Cooper, president; W. M. Bisbee, secretary; Jos. Ratliff, superintendent. Lands, 5 claims, area 120 acres, in the Bromide district, showing 3 fissure veins of 10' average width, carrying sulphide ores, and opened by 3 shafts, deepest 130'. Presumably idle.

ADVENTURE CONSOLIDATED COPPER CO. MICHIGAN.

Office: 45 Broadway, New York. Mine office: Greeland, Ontonagon Co., Mich. Employs 280 men. Organized 1898, under laws of Michigan, with capitalization \$2,500,000, shares \$25 par; \$19 paid in. Transfer agent, Old Colony Trust Co., Boston; registrar, American Loan & Trust Co., Boston. Isaac. H. Meserve, president; Wm. R. Todd, secretary and treasurer; W. A. O. Paul, assistant secretary and treasurer; C. J. Devereaux, Isaac H. Meserve, John Barker, Wm. R. Todd, Jas. L. Bishop and C. D. Hanchette, directors; Samuel Brady, superintendent; Richard Cocking, mining captain; S. A. Prince, clerk; Allan Eddyvean, mill superintendent; A. H. Sawyer, engineer.

Official returns to the state of Michigan, as of date, Jan. 1, 1904, disclose the following figures:

Amount cash paid in on capital stock.....	\$1,800,000.00
Amount paid in by conveyance of property to company....	250,000.00
Entire amount invested in real estate.....	250,000.00
Amount of personal estate.....	152,314.82
Amount of unsecured or floating debt.....	45,640.60
Amount due corporation.....	21,914.27

Calls on capital stock have been as follows: \$5 on organization; \$3, June, 1900; \$6, June, 1901; \$2, October, 1902; \$2, June, 1903; \$1 in 1904; total, \$19, or \$1,900,000. Production was 1,380,480 lbs. refined copper in 1904.

Lands include the old Adventure and Hilton tracts, in one body to the eastward, and the Knowlton tract lying a mile southwest, with total area of 1,696.22 acres on the mineral belt, also a millsite on Lake Superior. The mineral lands are located in Sections 35 and 36, Town 51 North, Range 38 West, and in Sections 1 and 2 of Town 50 North, Range 39 West. The Toltec and part of the Belt lie on the north; Aztec on the east; Toltec and Mass on the south, and the Mass on the west of the main tract. The Knowlton tract has the Mass to the north and east; Flint Steel to the south and Michigan to the west, the Ridge mine of the Mass lying between the two Adventure tracts. The village of Greeland lies on the northwestern corner of the Adventure's principal tract and the village of Maple Grove, controlled by the company, is near the mine.

The old Adventure mine was opened in 1850, along a line of old pits showing prehistoric mining. The largest annual production was 116 tons, 1,941 lbs. in 1857. After closed by its owners the old workings were tributed for years, with good results, being notably rich in silver. The Hilton, or Ohio mine, was opened on the Mass lode in 1863, but never was worked vigorously. The Knowlton was opened in 1853. These three old mines made 974 tons, 1,173 lbs. of refined copper previous to their merging as the Adventure Consolidated.

The present company began work Nov. 1, 1898, and has opened a large mine and equipped it with a surface plant of modern design and great capacity. The Adventure has a series of 7 parallel copper-bearing beds in a cross-section of about 1,200' and these, coupled with the existence of Adventure Bluff, a 300' hill, have caused the opening of the Adventure by adits as well as shafts. The "South Range," or "Evergreen Belt" of Ontonagon county comprises a belt of bedded traps, amygdaloids and conglomerates, 7 of these amygdaloids carrying copper on the Adventure tract. These lodes from north to south are as follows:

(1.) Knowlton. This is the bed on which the shafts of the mine are opened and apparently is the richest, running from 4' to 28' width, with an average of about 10'. It carries epidote, chlorite, prehnite and the minerals commonly found associated with these in the Keweenaw series. A considerable part of the product is heavy copper.

(2.) Merchants. About 10' wide, underlying the Knowlton bed at a distance of 20' to 65'; is a stamp lode, but has produced masses up to 500

pounds weight, and is opened by crosscuts, with considerable drifting, but is not so good a bed as the Knowlton.

(3.) *Mass.* A continuation of the same lode found at the Ridge mine of the Mass Consolidated. Averages 10' width and lies 100' south of the Merchants. Carries no heavy copper and but little stamp-rock. In the Hilton, to the east, the Mass lode shows good rock, as it also does in the Knowlton to the southwest.

(4.) *North Butler.* Lies nearly 100' south of the Mass, and carries some copper, but never has been tested sufficiently to prove its real worth.

(5.) *Butler, or Champion.* Is the most vigorous amygdaloid in the property, ranging 12' to 50' in width, with an average of about 20', and lies nearly 200' south of the North Butler. Ranges in value from very rich to absolutely worthless, carrying masses to a considerable extent, but in proportion to its great width gives but a small amount of stamp-rock, though fine stopes are opened occasionally, and always has been noted for its richness in silver. This amygdaloid apparently has a felsite base, and chemically and mineralogically is unlike the parallel strata on either side. A large amount of opening work has been done on this lode, and the present showing is somewhat encouraging. The Butler next to the Knowlton has the most development of any of the seven parallel beds of the mine.

(6.) *Ogima.* Lies about 100' south of the Butler, and has been but little opened on the Adventure, but shows some good stamp-rock.

(7.) *Evergreen.* Lies about 250' south of the footwall of the Ogima, and averages about 10' width. Has produced considerable copper at adjoining mines. The Evergreen has been tapped by a crosscut from the sixth level of No. 3 shaft, showing encouraging copper ground. The Evergreen is the best lode at the Mass mine, but has been given little attention at the Adventure.

The cupriferous lodes of the Evergreen belt are notoriously buncchy, being exceedingly rich in spots and entirely worthless at other points. The strike of the parallel lodes of the Adventure is N. 73° E. on the main tract, where operations are now in progress, and the shafts are sunk at an angle of 45°. There are 4 tunnels and 4 shafts, latter, except No 1 in the Merchant lode, being sunk on the Knowlton lode at 45°, and numbered from west to east. No. 1 is a 3-compartment shaft, 7x18' inside of timbers, 765' deep and idle. Surface equipment includes a 38x59' steel boiler-house with three 500-h. p. Burt boilers; a 59x59' steel engine-house having an Allis-Chalmers double-cone duplex direct-acting hoist with 24x60" cylinders, capable of raising a 12-ton load from a depth of 5,000' on an incline of 45° at a speed of 2,000' per minute, and a 38x65' steel compressor-house, with a 60-drill Rand-Corliss air-compressor of high efficiency. No. 1 shaft-house and rock-house are separate buildings, 200' apart.

No. 2 is a 2-compartment shaft 6x12' inside of timbers and was discontinued at depth of 190' and hoist removed.

No. 3 is a 3-compartment shaft 7x18' inside of timbers, 865' deep, with a 42x84' combination steel shaft-rockhouse 116' high. The 59x59' engine-

house is of wood, with a duplicate of the hoist at No. 1. This is the principal shaft of the mine.

No. 4 is a development shaft with temporary equipment, 2,500' east of No. 3, and has reached but slight depth. The easterly shafts are showing encouraging ground. Crosscuts have been driven south from both shafts 1 and 2 to intercept the parallel lodes.

Water for boilers is taken from a stream dammed near No. 1 shaft. The mine has a complete electric light and power plant, and a system of electric haulage in the Butler tunnel. The principal mine buildings are sheathed with steel and painted, and the mine location is an exceptionally handsome one. Protection from fire is secured by water mains, fed from a reservoir on Adventure Bluff. The mine is reached by a spur of the Copper Range Railroad.

The stampmill is at Edgemere, on Lake Superior, put in commission Sept. 22, 1902. The mill, built and equipped by the Allis-Chalmers Company, is 135x217', of steel on stone foundations with 69x72' boiler-house and 38x72' pump-house. Equipment includes 3 Allis-Chalmers heads, fitted with Parnall-Krause mortars having 11-16" openings in discharge screens, with two horizontal revolving screens having 5-16" openings for each head. The stamp pistons are automatically rotated, equalizing wear on the shoes. From the revolving screens of the heads the crushed rock goes to the separator jigs, 24 for each head, or 72 to the mill, thence to 36 finisher jigs. There are round slime-tables, 3 Overstrom and 3 Wilfley concentrators and Huntington mills for the raggings. The rock bins have a storage capacity of 4,500 tons. Coal is delivered from trestles to boiler-rooms by gravity, through chutes. The pump is a 16,000,000-gallon Riedler, drawing its supply from Lake Superior through a tunnel extending 1,200' under the bed of the lake. Miscellaneous improvements at the millsite include an office, smithy, machine shop, dwellings, etc. There is 8' to 12' of clear water off-shore, permitting the landing of cargoes from scows, in good weather.

Mr. Brady took charge on April 1, 1904, and the improvement in the prospects of the mine since that date has been little short of marvelous. In 1903 the company lost \$80,279 on operating expenses, plus \$61,611 expended for construction work. At the close of 1904 the property is nearly or quite paying all expenses. High water mark in production was reached in June, 1903, with an output of 155 tons of mineral, after which the product declined steadily until April, 1904, when it was but 63 tons. Under Mr. Brady's careful and sagacious management the production has increased steadily, reaching 120 tons in December, 1904. Not only has the production been doubled, but reserves have been increased each month. Two heads at the mill are operated, days only. It is too early as yet to say that the Adventure is out of the woods, but its prospects are fair, whereas one year ago they scarcely could have been worse.

AETNA MINE.

MICHIGAN.

Address: care of W. K. Prudden, Lansing, Mich. In Keweenaw Co., Mich. Produced 70 tons, 881 lbs. refined copper, 1863-1873; since idle.

AETNA GOLD & COPPER MINING CO.**UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. J. A. Kauffman, superintendent. Has auriferous and argentiferous copper ores, with small steam plant.

AETNA MINING CO.**COLORADO.**

Letter returned unclaimed from Bonanza, Saguache, Co., Colo.

AETNA MINING CO.**WYOMING.**

Office: care of R. H. Fehland, Merrill, Wis. Mine office: Riverside, Carbon Co., Wyo. Employs 9 men. Julius Thielman, secretary; Roger Daniels, superintendent. Organized under laws of Wyoming, with capitalization \$1,000,000, shares \$1 par. Lands, 7 claims, area 140 acres, in the Upper Plate district, showing 4 veins of 3' to 6' width, as fissures and contact veins between granite and quartzite, carrying chalcopryrite, bornite and chalcocite estimated to average 25% copper, and developed by shaft of 200' and tunnels of 125' and 380'. Has a 40-h. p. steam plant. Property considered promising, and management honest.

AFORTUNADA COPPER MINES, LTD.**SPAIN.**

Offices: 10, Norfolk St., London, W. C., Eng. Mine office: Figueras, Gerona, Spain. Hon. J. A. de Grey, chairman. Capitalization, £75,000; debentures, £10,000 authorized, £5,300 issued. Lands, 69 hectares, area about 175 acres, leased from Spanish government at annual rental of £8 17s. and 2% royalty on gross production.

AFRICAN & AUSTRALIAN CO., LTD.**AUSTRALIA.**

Offices: 257, Winchester House, London, E. C., Eng. J. B. Palmer, chairman; H. J. Dixon, secretary. Is the third reconstruction of the West Australian Mining Co. and Victoria Copper Co., with capitalization £120,000, shares 2s. par. Holds a stock interest in the Copper Selection Syndicate, Ltd.

AFRICAN NOBLE DUKE GOLD & COPPER MINING CO.**ARIZONA.**

Office and mine: P. O. Box 1351, Bisbee, Cochise Co., Ariz. George W. Vandermark, president; Joseph Hughes, vice-president.

AFTERTHOUGHT MINING CO.**CALIFORNIA.**

Property sold to Great Western Gold Co.

AFTON MINING & SMELTING CO.**MONTANA.**

Office: Helena, Mont. Organized 1897, under laws of Washington, with capitalization \$60,000, shares \$500 par, \$70 paid in. T. J. Davies, president; F. M. Dudley, secretary. Lands, 3 claims, area 44 acres, in Colorado Gulch, Lewis & Clarke county, Montana, showing 3 fissure veins, one with an average width of 75', carrying sulphide ore and small quantities of oxides and carbonates having an estimated average tenor of 2%. Development is by 4 shallow shafts and a 730' tunnel. Presumably idle.

AGASSIZ MINING CO.**ARIZONA.**

Office: 92 State St., Boston, Mass. Letter returned unclaimed from former mine office, Ray, Pinal Co., Ariz. Organized 1900, with capitalization \$1,250,000, shares \$1 par. Lands, 17 claims, also 40 acres of placer gold property on the Gila River, near Ray. Idle.

AGATE HARBOR MINE.

MICHIGAN.

Address: care of John H. Gatiss, owner, Eagle River, Mich. Has been prospected to some extent, but never was a producer.

AGORDO MINE.

ITALY.

A small copper mine in the province of Venetia, Italy.

AGUA BLANCA MINE.

MEXICO.

Controlled by the Dwight Furness Co. A partly developed property, about ten hours' ride (horseback), northwest of Autlan, Jalisco, Mexico.

AGUASCALIENTES METAL CO.

MEXICO.

Office and mine: Asientos, Aguascalientes, Mex. Employs 350 men. Dr. Chas. L. Bennett, president; Kuno Doerr, vice-president; Victor Hunton, secretary; Albert Doerr, general manager. Organized Dec. 31, 1901, under laws of Mexico, with capitalization \$35,000, Mexican, shares \$500 par. Is operated as a close corporation. Lands, 50 pertenencias, area about 125 acres, in the Asientos and Tepezalá districts, showing 5 ore bodies, of which 3 are being developed, these having average width of 5' and carrying average values of 5% copper, 8 oz. silver and 0.2 oz. gold per ton, in oxide, carbonate and sulphide ores. The Merced-Orito mine, 8 kilometers, west of Cobre Station on the Mexican Union Railway, has shafts of 250' and 300' and the San Simon y Anexas have a 300' tunnel. Has a 110-h. p. De Laval steam turbine, electric hoist and Cameron electric triplex pump, at the Merced-Orito. The Mexican Central railroad reaches the mines. Output averages 1,250 tons of ore monthly and is sold the Aguascalientes smelter of the American Smelting & Refining Co. Production in 1904 was 1,000,000 lbs. fine copper, 100,000 oz. silver and 1,500 oz. gold.

MINA AGUILA.

MEXICO.

In the Sierra Ponces, Chihuahua, Mexico. White & Duran, operators. Has argentiferous copper ore.

GEWERKSCHAFT AGNESENHÜTTE.

GERMANY.

Has sundry mines of iron and copper pyrites in Hessen-Nassau, Germany.

AHMEEK MINING CO.

MICHIGAN.

Office: 199 Washington St., Boston, Mass. Mine office: Kearsarge, Keweenaw Co., Mich. Organized 1880, under laws of Michigan, with capitalization \$1,250,000, shares \$25 par; \$17 per share paid in, of which \$10 was by transfer of property and \$7 in cash, last call, \$5 per share, having been made Feb. 5, 1904. A. S. Bigelow, president; W. J. Ladd, secretary and treasurer; Wm. E. Parnall, superintendent; Wm. J. Uren, assistant superintendent. Lands, 920 acres, lying west and south of the Mohawk. Was set off in 1880, by the Seneca company, to work the Kearsarge or Houghton conglomerate, and under the management of Capt. John Daniell sunk 2 shafts in this bed, which averages about 70' width, with 3 pay-streaks, of 2' to 3' width each, aggregating 7' width, each carrying copper in good quantities, but not payable, owing to great width of partially or wholly barren rock. Resumed work December 2, 1902, and exchanged 11.188 acres with the Allouez in July, 1903, for an equal area, this giving each property a better arrangement of lands for development. The Kearsarge lode was located

by diamond drill in the spring of 1903, and immediately opened by a 137' crosscut sent from the bottom of an old 100' vertical shaft. The lode was found both wide and strong, carrying a high grade of stamp-rock and heavy copper, fully equal in appearance to almost any other opening on the wonderful Kearsarge lode. The crosscut also showed finely disseminated copper in the footwall for 20' before reaching the lode. Drifting was begun when the lode was reached and an incline shaft, known as No. 1, was holed through to surface.

The mine is opened by 2 shafts, 1,450' apart. Owing to the configuration of the tract, there is no room on the outcrop for further shafts. No. 1, the southerly shaft, 589' deep, has drifts opened on the first and third levels, with a plat cut for the fourth level. No. 1 has a temporary shaft-rockhouse, with one crusher. No. 2 shaft, 455' deep, has a 1,500' hoist with 2-ton skip. The machinery plant of the mine is of an exclusively temporary nature and will be replaced during 1905-1906, by permanent buildings, boilers, hoists, etc. The mine has 6 and 8-drill air compressors, merely adequate for present requirements.

The mine is very rich, as richness goes in the low-grade Lake Superior district. No. 1 shaft, which will be cut off by the side lines of the Allouez at a depth of slightly less than 3,000', apparently is the richer of the two, but No. 2 is by no means a lean shaft. In sinking these shafts concrete has been substituted for wooden sleepers. These were moulded in place upon the natural anchorage of rough rock, cores being left for rods to bolt the rails to the stringers. This reduces the fire hazard and the concrete ties are cheaper than those of wood. It is quite certain, however, that the concrete ties will mean considerably heavier wear upon both rails and wheels, this being the experience of railroads that use rigid concrete or metal ties.

Considerable diamond drilling was done early in 1904, and a complete geological cross-section of the tract secured thereby. Rock shipments were begun from No. 1 shaft on April 21, 1904, to the Tamarack mill, rock sent being from accumulated stock piles and from rock broken underground in opening work. Shipments from No. 2 were begun about three months later, and the stock-piles were cleaned up in November. Just before the close of 1904 shipments were changed to the Isle Royale mill, as the Tamarack no longer had surplus milling facilities. The production secured during the last 7 months of 1904, ran 20 to 25 tons of mineral monthly, the rock yielding, with very scanty selection, about 30 lbs. mineral per ton, equal to about 22 lbs. refined copper. The plan of mining has been changed to permit a larger production and instead of ordinary drifts of 7x7' the mine now carries drift-stopes 10' to 18' in height and the full width of the lode, this furnishing about 4,000 tons of rock monthly, making about 60 tons of 75% mineral, worth about \$13,500, which goes some distance toward paying for development work.

The Ahmeek makes a considerably better showing than the Wolverine made, upon the same lode, at a similar stage of development. Beyond question the Ahmeek is one of the future great mines of Lake Superior

COMPAGNIE DES MINES D'AIN-BARBAR.

ALGERIA.

Offices: 39, Rue Dulong, Paris, France. Mine is in the department of Constantine, Algeria, having several veins of chalcopryite assaying 8% to 15% copper, associated with sphalerite and galena. Idle since 1899.

AJAX GROUP.

BRITISH COLUMBIA.

On Valdes Island, Nanaimo district, B. C. A prospect from which 30 tons of ore yielded 25% copper and \$6 gold and silver per ton.

AJAX MINE.

MONTANA.

Mine office: Fox, Beaverhead Co., Mont. Noyes & Morse, owners; W. B. Stanchfield, superintendent. Ores carry gold, silver, lead and copper. Has steam power and 5-stamp mill.

AJAX MINING CO.

UTAH.

Office: Salt Lake City, Utah. Thos. Weir, president; John M. Burt, secretary. Property is operated by lessees under contract with management of the property. For the year ending Oct. 1, 1904, production was 514 tons of silver-lead ore and 3,552 tons of second-class copper ore carrying values of \$10 to \$15 per ton. Main shaft is 1,000' deep.

AJO COPPER MOUNTAIN MINES CO.

ARIZONA.

Office: 237 Crossley Bldg., San Francisco, Cal. Mine office: Gila Bend, Maricopa Co., Ariz. Chas. Henderson, president; O. F. Melden, secretary; Anthony Bray, superintendent. Capitalization \$1,000,000. Holds the Ajo mines, including the Shotwell mine in the Ajo Basin, 120 miles south of Tucson and 170 miles southeast of Yuma, under bond and lease from Thos. Doak & Son, owners. Property includes antiguas worked by Spaniards and Mexicans and has produced considerable rich copper ore, including native copper, shipped to Swansea and San Francisco for reduction. The Shotwell mine has a ten-stamp mill and 2 Woodbury concentrators. Property is rich, but handicapped by lack of adequate transportation facilities.

AK-SAR-BEN COPPER CO.

WYOMING.

Mine office: Encampment, Carbon Co., Wyo. A. H. Crow, superintendent. Property has a strong gossan capping of hematite and limonite, and an 80' shaft, with small steam plant.

ALABASTER CAVE GROUP.

CALIFORNIA.

Owned by Holmes Lime Co., San Francisco, Cal. Lands, 180 acres, 7 miles east of Newcastle, Placer Co., Cal. Vein traceable 6 miles, with strong gossan outcrop. Ore said to average 4% copper, from pay-streak of 3' to 8' in contact vein 12' to 20' wide, between limestone and slate.

ALADDIN & CAPE NOME MINES.

MONTANA.

Mine office: Clinton, Missoula Co., Mont. Idle at last accounts.

ALAMO COPPER COMPANY.

ARIZONA.

Said to have copper claims near Ajo, Arizona, but neither claims nor company located.

ALASKA COPPER & COAL CO.

ALASKA.

Office: 146-45 Broadway, New York, N. Y. Was organized originally as Alaska Copper Co., but changed name to present title to avoid confusion with Judge Mellen's company of the same name, at Coppermount. Organized

under laws of West Virginia, with capitalization \$3,500,000, shares \$10 par. Henry O. Havemeyer, Jr., president; Ernest Truslow, secretary and treasurer. Property is known officially as the Kennicutt group, but is more commonly known as the Bonanza group, located 180 miles by trail northeast of Valdez, Alaska. Although this property is claimed by the Copper River company, and also by the Chittna Exploration Co., patents to the 3,000 acres comprising this tract have been issued by the United States government to the Alaska Copper & Coal Co., whose title apparently is perfect. At last accounts from Alaska, exploratory work was in progress and the property was guarded by armed men, acting under instructions to prevent all trespassing.

This property, by common consent of all who have seen it, including officials of the United States Geological Survey and other competent observers, is one of the most promising to be seen anywhere, and bids fair to make an exceptionally rich and large mine. Management of the company is excellent.

ALASKA COPPER CO.

PRINCE OF WALES ISLAND, ALASKA.

Office: 430 Globe Bldg., Seattle, Wash. Mine office: Coppermount, Prince of Wales Island, Alaska. Organized 1900, under laws of Washington, with capitalization \$5,000,000, shares \$25 par. Henry W. Mellen, president and general manager; Chas. R. Reynolds, vice-president and superintendent; Frank T. Hunter, secretary and purchasing agent; D. D. Stewart, mine superintendent; J. H. Cready, smelter superintendent; Frank B. Seeley, engineer; O. Gerle, chemist. Lands, 18 patented claims, area 360 acres, also 18 patented millsites, area 80 acres, giving $1\frac{1}{4}$ miles frontage on Copper Harbor, a land-locked haven with deep water. Lands are on Copper Mountain, rising to a height of 3,600' directly from the harbor. Property is estimated to carry 20,000,000' of marketable timber, and actuates all machinery by water-power, partially developed by a 22' steel pipe line of 1,900' from Reynolds creek to the power plant, where there are 2 water-wheels of 300-h. p., total available power being estimated at 2,800 h. p.

Lands carry 3 veins, of which the Brooklyn is 10' to 30' wide, showing chalcopryite assaying 3% to 34% copper. The New York vein is a contact between porphyry and limestone, 10' to 60' wide and 500 tons of selected ore therefrom gave smelter returns of 16.9% to 29.06% copper, being the richest copper ore ever produced on the Pacific coast. The principal vein is the Indiana, in limestone near a granite intrusion, with extreme width of 280', showing an average of above 5% copper and \$2 gold per ton, with occasional assays running up to 25% copper and \$6 gold per ton. Has a 150' shaft, with tunnels of 200', 430' and 500', showing oxide and carbonate ores, with a little native copper near surface, and sulphides at depth, on the New York vein. Mining is planned to be done mainly by tunnel, giving cheap extraction. Surface plant includes tramway, hoists, air-compressor, sawmill, and necessary mine buildings and dwellings.

A 250-ton Allis-Chalmers furnace is installed and the smelter should be blown in about March, 1905, barring accidents. The buildings are planned

for a 600-ton plant and designed with a view to doubling the capacity later when desired.

A large amount of ore, estimated at \$250,000 in value, is at the smelter awaiting treatment and a considerable production should be secured during 1905. The management of the company is excellent, both as to honesty and capacity and the mine itself is one of exceptional promise, bidding fair to make one of the largest copper producers of the Pacific Coast within the next few years.

ALASKA INDUSTRIAL CO.

ALASKA.

Office: 11 Broadway, New York. Mine office: Sulzer, Prince of Wales Island, Alaska. Employs 26 men. Hon. John P. Jones, president; Robert A. Lawrie, vice-president; Wm. Leavitt Haines, secretary; Chas. A. Sulzer, general manager; C. B. Ferguson, superintendent; Maj. Henry G. Catlin, engineer. Organized 1899, under laws of New Jersey, with capitalization \$1,000,000, shares \$1 par; \$600,000 unissued. Company has no liabilities. Annual meeting, second Monday in November. Lands, 60 patented claims, area 1,200 acres, also 60-acre millsite, 80-acre townsite and miscellaneous timber lands, giving total landed area of 2,200 acres. Has 7 wide contact veins, between granite and limestone, said to give average assays of 6% copper, 3 oz. silver, traces of lead and \$3 gold per ton, from oxide, carbonate and sulphide ores. Has shafts of 25', 30' and 60', with 43 open cuts and 5 tunnels, longest 210', on the Jumbo group; tunnels of 29' and 132' on the Green Monster claims, and a 138' tunnel on the Mt. Vesta claim. A water power of about 1,000-h. p. is available for development. Has necessary mine buildings and dwellings, sawmill and a general store, with tidewater at the mine. At close of 1904, was completing a combination aerial and surface tram, and installing an air compressor plant on the Jumbo group. Company hopes to be in physical condition to begin regular ore shipments by spring of 1905, having developed about 200,000 tons of high-grade chalcopryite. Both management and property considered good.

ALASKA MINING CO.

UTAH.

Mine office: Silver City, Juab Co., Utah.

ALASKA SMELTING & REFINING CO.

ALASKA.

Office: care of Samuel Silverman, general manager, Spokane, Wash. Mine office: Coppermount, Prince of Wales Island, Alaska. Is an auxiliary corporation of the Brown-Alaska company. Paul Johnson, smelter superintendent. Has a small but complete smelting plant, erected 1903-1904, and plans doing a general custom smelting business.

ALBERNI GOLD & COPPER CO., LTD.

BRITISH COLUMBIA.

Letter returned unclaimed from Alberni, Vancouver Island, B. C. Property is the Thistle group, on Douglass Mountain, showing chalcopryite assaying up to 1 oz. gold per ton. Idle at last accounts.

ALBION COPPER MINING CO.

MONTANA.

Mine office: Sunday, Granite Co., Mont., Christian Reichert president; James M. Hinkle, secretary. Lands, opened by tunnels, show 3 veins, carrying copper, gold, silver and lead ores of concentrating grade.

ALBION MINING CO.**UTAH.**

Office: care of Hatfield & Sons, Salt Lake City, Utah. Property is the Albion group in Little Cottonwood Cañon, Salt Lake county, which is said to have yielded about one million dollars worth of ore under former ownership. Tunnel is being driven to drain old workings and open new ground. Has water power.

ALDA COPPER MINES, LTD.**SPAIN.**

Offices: Dashwood House, London, E. C., Eng. Mine office: Cabrales, Asturias, Spain. Henry Higgins, chairman; S. T. H. Renwick, secretary. Company is in debt and another reorganization is proposed. Property includes 7 copper mines, one coal mine, and a 30-ton smelter. Has shipped 200 tons of 30% gray ore from the Don Fulano mine, which shows a 6' vein.

ALDA MINING & SMELTING CO., LTD.**SPAIN.**

Reorganized as Alda Copper Mines, Ltd.

SOCIETE MINIERE D'ALDEIRE.**SPAIN.**

Mine office: Aldeire, Guadix, Granada, Spain.

COMPANHIA MINEIRA ALEMTEJANA.**PORTUGAL.**

Office: 4, Praça dos Remolares, Lisbon, Portugal. Mine office: Beja, Alemtejo, Portugal. Waldemar d'Orey, superintendent. Property is a group of old mines in the San Domingos district, showing two ore bodies occurring in schists, the selected product giving about 25% copper from carbonate and sulphide ores. Property was discovered and operated by the Romans.

ALESSANDRO COPPER MINING CO.**NEW MEXICO.**

Office: 35 Union St., New Haven, Conn. Mine office: Silver City, Grant Co., N. M. Joseph C. Kelly, president; Edw. Parkhurst, secretary; Lucius P. Deming, manager. Organized April, 1900, under laws of West Virginia, with capitalization \$500,000, shares \$1 par. Debentures, \$100,000 authorized at 6%; issued, \$5,000. Lands, 50 claims, area 1,000 acres, also 5-acre millsite, in the White Signal, Burro and Anderson districts. Is developing 9 ore bodies, occurring as lenses, or impregnations in the neighborhood of porphyry, these giving average assay values of 8% copper and 5 oz. to 40 oz. silver per ton, principally from carbonate and sulphide ores. Has 9 shafts, from 40' to 225' in depth, also 9 tunnels, from 15' to 400' in length, with total underground openings of 1,300'. Has steam power, necessary mine buildings, 50-ton concentrator and leaching plant partly built. Idle since early in 1904, but hopes to resume work soon. Company said to be free from debt.

ALGOL MINE.**CALIFORNIA.**

Mine office: Spenceville, Nevada Co., Cal. Opened circa 1865, reopened 1899. Has a 50' vein with 2" to 10" pay-streak, opened by two shafts, each 120'. Ores are cuprite, malachite and azurite, also native copper and a little gold, giving average smelter returns of 20% copper. Has steam power.

ALGOMA COMMERCIAL CO., LTD.**ONTARIO.**

Office: Sault Ste Marie, Ont. C. M. Boss, superintendent. Property is the Elsie, Wilmot and other mines, 4 miles from Sudbury, Algoma, Ontario. Is closely allied with the Lake Superior Power Co.

ALGOMA & CALUMET DEVELOPMENT CO.**ONTARIO.**

Office: Calumet, Mich. Capitalization \$400,000, shares \$10 par; \$40,000 issued. Lands are in Algoma, Ontario.

ALGONQUIN COPPER CO.**WYOMING.**

Office: 177 Broadway, New York. Henry H. Adams, secretary. Organized under laws of Wyoming, with capitalization \$1,000,000.

ALICANTE GROUP.**COLORADO.**

Letter returned unclaimed from Wortman, Lake Co., Colo. Ores carry gold, silver, lead, copper and zinc. Has steam power and 35-ton concentrator. Idle.

MINA EL ALICANTE.**MEXICO.**

Mine office: Mazapil, Zacatecas, Mex. M. Dolores Aguirre y Ca., owners; Vicente Banavides, superintendent. Ores carry gold, silver, lead and copper. Employs about 50 men.

ALICE MINE.**MONTANA.**

Mine office: Butte, Silver Bow Co., Mont. An old and once highly profitable silver producer, which may be reopened for copper values.

ALICE GOLD MINING CO.**WASHINGTON.**

Office: 204 Empire State Bldg., Spokane, Wash. Mine office: Blue Creek, Stevens Co., Wash. Organized 1896, under laws of Washington, with capitalization \$150,000, shares 10c. par. J. F. Nylander, president; W. M. Higley, secretary and treasurer; Benj. F. Parker, general manager. Lands, 11 claims, area 225 acres, in the Chewelah district, showing 4 fissure veins and lenses, latter of considerable dimensions and carrying sulphide ores giving good assay values in gold and copper, opened by two 200' shafts and 2 short tunnels.

MINA DE ALJUSTREL.**PORTUGAL.**

Mine office: Aljustrel, Portugal. Owned by a Belgian company. Has chalcoppyrite, associated with iron pyrites, giving 1% to 7% copper, and is a small but steady producer.

ALLEGHENY MINING CO.**NEW JERSEY.**

Organized 1901, to work old copper mines in Pahaquarry township, near Delaware Water Gap, Warren County, New Jersey.

ALLEN MINE.**OREGON.**

Office: care of Chas. d'Autremont, Jr., Duluth, Minn. Mine is located on the Rogue River, Oregon, and ore carries good values in gold and silver.

ALLENDE HERMANOS y CA.**SPAIN.**

Mine office: Elizondo, Navarra, Spain. Don Pedro Allende, superintendent.

ALLIANCE COPPER MINING CO.**WASHINGTON.**

Absorbed by Iconoclast Consolidated Mines Co.

ALLIGATOR & TIGER LEASING CO.**COLORADO.**

Mine office: Red Cliff, Eagle Co., Colo. A co-partnership. A. S. Little, manager. Lands, 2 claims, showing massive bornite and chalcoppyrite in fissure veins, traversing granite, ores assaying 15% copper, 5% lead, 50 oz. silver and \$10 gold per ton.

ALLOUEZ MINING CO.**MICHIGAN.**

Office: 60 State St., Boston, Mass. Mine office: Allouez, Keweenaw Co., Mich. Organized 1859, reincorporated 1889, under Michigan laws, with capitalization \$2,500,000, shares \$25 par, \$22.25 paid in. New stock issue of 20,000 shares was divided pro rata among shareholders of record, June 1, 1901. Last assessment, \$3 per share, levied 1904. Only \$2.75 per share remains callable, but capitalization can be increased if necessary, and new stock sold, or issued pro rata to shareholders. Annual meeting, second Tuesday in March. H. F. Fay, president; Geo. G. Endicott, secretary and treasurer; Jas. Chynoweth, superintendent; H. F. Fay, Godfrey Morse, John C. Watson, Stephen R. Dow, Walter L. Frost, H. A. Tucker, Geo. G. Endicott and Jas. Chynoweth, directors.

Official returns to the state of Michigan, as of date Jan. 1, 1904, disclose the following figures:

Amount cash paid in on capital stock.....	\$1,892,352.00
Entire amount invested in real estate.....	73,303.57
Amount of personal estate.....	89,416.32

Lands are about 3,400 acres all told, of which a compact tract of 640 acres contains the old Allouez mine proper and the new mine now being opened. Areas of 11.188 acres were exchanged between the Allouez and Ahmeek, to mutual advantage, in 1903.

The old mine, opened 1859, is on the Allouez conglomerate, a bed underlying the greenstone that is such a noticeable rock stratum in Keweenaw county. The conglomerate is 30' wide in many places, with strike of N. 39°E, and dip of 38°. Lode averages 0.7% to 1% copper, and is very refractory under the stamps. There are 3 shafts, deepest about 1,700'. Mining was begun actively in 1869, and stopped in 1877, with an exhausted treasury. The mine was then leased to Watson & Walls, who made money from it, after paying a royalty of one-eighth on gross production. In 1880 the company resumed control, to quit once more, financially exhausted, in 1885. Watson & Walls took the mine again and once more did well; the company resumed work on its own account for the third time, and again lost money, stopping all work in 1892. The old mine has been idle for some years, except for exploratory and development work 1898-1900, when a shaft was sunk 1,200' on the Osceola lode, and nearly 4,000' of openings secured thereon, with indifferent results. The shaft-house at the Osceola shaft has been demolished. The stamp-mill, on Hills Creek, has three old-fashioned heads and cannot be used for the new mine. The Allouez has made 13,025 tons, 1,528 lbs. refined copper.

The present development is on the Kearsarge lode, where a new mine is being opened. This lode shows extremely well in the North Kearsarge, just south of the Allouez, and a half mile to the north on the Ahmeek lands, but does not outcrop on the Allouez tract, although underlying the entire 640 acres, consequently must be opened on the underlay. No. 1 shaft was started May 15, 1903, on the extreme southeast corner of the property, and should reach the Kearsarge amygdaloid at a depth of approximately 1,400'

about March 1, 1905. The shaft is sunk at an angle of 80° , changing to 75° near the collar of the shaft, and is planned to take the angle of the lode when the bed is cut. The shaft has 3 compartments, with 3-ton skips and hoist good for depth of half a mile, and was 1,294' deep at the close of 1904. Owing to the exceeding steepness of shaft, only 10° less than vertical, back-rails of 6x10" timber are set so close to the wheels of the skips that their flanges cannot leave the steel rails, the wooden timbers really serving as guides. At the change of angle from 80° to about 38° on reaching the lode, a single idler with very wide flange will care for the cables passing at either end. In order to save pumping charges on surface-water entering the mine, a gutter has been cut entirely around the shaft, leading to an opening 36' long, half winze and half drift, used as a sump from which the water is forked. The shaft has a 42x62' steel shaft-rockhouse to have two 18x24" crushers.

No. 2 shaft, 2,000' northeast of No. 1, was started late in 1904. Each shaft can be sunk to a depth of some 9,500' before reaching the company's boundary line. Exceptional progress was made in sinking No. 1 during 1904, when it was deepened 1,014', which is the record for sinking in the Lake Superior district. The depth of the lode is 38° at the North Kearsarge mine, but most unexpectedly is much flatter at the Allouez, hence the shaft will cut the lode at a depth of about 1,400', instead of at about 1,000' as expected. Two drill cores from the lode showed widely divergent returns, one being very lean, while the other was phenomenally rich. No 1 shaft has exceptionally heavy timbering, about 60' of timber and lagging being used for each foot of the shaft's length.

No. 1 shaft has a temporary hoist, but this will be replaced in 1905 by a 32x72" duplex-cylinder Nordberg hoist with an 18' double conical drum. Foundations for all mine buildings at No. 1 shaft have been built, and the ground filled with about 10' of broken rock, hence superstructures can be erected quickly whenever needed. The engine-house is of mine rock, with redstone trimmings. The boiler-house has been extended, and has two 125-h. p. boilers, with room for 3 more, and has a 120' self-supported steel smoke stack. An old air-compressor from the old mine suffices for present requirements, but will be replaced later.

The mine has a spur-track of the Mineral Range railroad. The Allouez can have the use of one head at the Centennial mill when needed, and as this will be compounded it can treat up to about 700 tons daily. The Allouez should have 12 to 15 drifts under way before the close of 1905, and if these are carried as drift-stopes, can supply considerable stamp rock.

All improvements are of the most substantial nature, and all work is planned with an eye to exacting requirements in the future. The Allouez, because of the magnificent mines opened on the same lode upon either side, cannot be regarded as an experiment, but must be considered an assured mine with a great future.

ALMA COPPER MINING CO.

MEXICO.

Office: Des Moines, Ia. Mine office: Carbo, Ures, Sonora, Mex. Abner Graves, general manager; Nelson D. Graves, superintendent. Lands, 747

acres, in the Ures district, showing auriferous, argentiferous and somewhat bismuthiferous copper ores, in the forms of malachite, azurite, chrysocolla, cuprite and melaconite, assaying up to 37% copper and \$13 gold per ton. Has gasoline power,

ALMA GOLD MINING CO.

COLORADO.

Office: Idaho Springs, Clear Creek Co., Colo. J. J. May, supt. Ores carry gold, silver and copper. Has steam power and employs about 20 men.

ALMA MINE.

BRITISH COLUMBIA.

Letter returned unclaimed from former mine office, Lardo, B. C.

ALMADO & TIRITO CONSOLIDATED MINING CO.

MEXICO.

See Negociacion Minera de Clemente Ybarra.

SOCIEDAD MINERA DE ALMANZORA.

SPAIN.

Office: care of Don Camilo Bilarge, agent, Javier Sanz, 4, Almeria, Spain. Property includes sundry copper mines in Almeria, idle at last accounts.

ALMEDA MINING CO.

OREGON.

Office: 414 Abington Bldg., Portland, Ore. Mine office: Galice, Josephine Co., Ore. Employs 12 men. O. M. Crouch, president; R. C. Kinney, secretary and treasurer; John F. Wickham, general manager. Organized Sept. 17, 1900, under laws of Oregon, with capitalization \$1,000,000, shares \$1 par. Lands, 7 claims, area 140 acres, also 5-acre millsite and 30 acres miscellaneous lands, in the Galice district, showing a contact vein between porphyry and slate said to be 107' wide and traceable 2,300', giving average assays of 3% copper and \$4.50 gold per ton, with traces of silver and lead, from chalcopryrite, developed by 8 tunnels, longest 310', having 970' of underground openings. Was originally worked to slight depth for free gold, circa 1860-1870.

ALMERIA QUICKSILVER & COPPER CO., LTD.

SPAIN.

Offices: 17, Royal Exchange Square, Glasgow, Scotland. Mine office: Berja, Almeria, Spain. W. D. Gillies, chairman; W. G. Millar, secretary. Capital, nominal, £45,000, shares 6s. par; issued, £38,695. Lands, 1,100 acres, including 4 old mines, carrying ores of quicksilver and copper, in process of development. Also has a quicksilver smelter at Cástoras, Granada.

ALMOLOYA MINING CO.

MEXICO.

Office: 305 Trust Bldg., Los Angeles, Cal. Mine office: Baca, Ramal de Parral, Chihuahua, Mex. Employs 150 men. Organized 1903, under laws of Arizona with capitalization \$2,000,000, shares, \$1 par. N. O. Bagge, president; I. B. Newton, secretary; D. W. Shanks, general manager; Los Angeles Trust Company, registrar and trustee. Lands, 57 pertenencias, area 148 acres, near the famous Cigarrero mine, in the Sierra de Almoloya, an isolated mountain range on the Parral branch of the Mexican Central railroad. Is sinking 3 two-compartment vertical shafts, planned for depths of 300', 500' and 1,000' and is driving an 800' tunnel. Ores carry gold, silver, lead and copper. Has gasoline and electric power and plans installing a new 300-h. p. electric plant. Management considered good and property promising.

ALPS MINING CO.**COLORADO.**

Mine office: Central City, Gilpin Co., Colo. James Williams, superintendent. Ores carry gold, silver and copper. Has steam power.

ALSACIA DEVELOPMENT CO.**MEXICO.**

Office: care of Chas. F. Wren, secretary, Bisbee, Ariz. R. L. Whaley, president. Lands are in the Ajo mountains, Arizpe district, Sonora, Mexico, opened by 2 shafts, with about 1,200' of underground development showing silver copper ores, giving average assays of about \$25 per ton. Work suspended August, 1904, owing to wrangle among shareholders. Property regarded as promising.

ALTA-IDAHO GOLD & COPPER MINING CO.**IDAHO.**

Office: care of J. M. Nuss, Nescopeck, Pa.

ALTA-PERUVIAN MINING & MILLING CO.**UTAH.**

Office: Springville, Utah. Mine office: Alta, Salt Lake Co., Utah. Organized 1904, with capitalization \$200,000, shares \$1 par. F. J. McAuliffe, president; T. R. Kelley, secretary and treasurer. Lands, 4 claims, in the Little Cottonwood district.

ALTA-QUINCY MINE.**UTAH.**

Mine office: Alta, Salt Lake Co., Utah. Alexander Colbath, superintendent. Lands are opposite the Columbus Consolidated, opened by tunnel cutting a 25' fissure vein with hanging wall paystreak, averaging 11% copper, 10 oz. silver and \$2.80 gold per ton.

ALTALTA MINING CO.**ARIZONA.**

Office: 145 La Salle St., Chicago, Ills. Mine office: Chloride, Mohave Co., Ariz. J. F. McBride, president and manager; A. H. Dryden, superintendent. Ores carry gold, silver, lead and copper, precious metals predominating in value. Opened by shaft and has gasoline power. Employs 10 to 12 men and management contemplates installation of a concentrating plant.

ALTAMONT MINING CO.**NEW MEXICO.**

Office: care of Capt. L. H. Williams, president, Altamont, Ill. Lands, showing copper ores, are in the Jarilla district, Otero Co., New Mexico.

KÖNIGLICHES HÜTTENAMT ALTENAU.**GERMANY.**

Office and works: Altenau in Harz, Germany. Is a custom smelting plant, treating ores of copper and other metals from the mines of the Hartz.

ALTENS KOBBERGRUBER.**NORWAY.**

Office: care of Sulitelma Aktiebolag, Helsingborg, Sweden. Mine office: Kaafjord, Finnmarken, Norway. Otto Witt, general manager; P. W. George, mining engineer; Th. Boche-Wüg, concentrating engineer; Sverre Falch, chemist; R. Rusten and Gustaf Swensson, mine superintendents. Is the northernmost copper mine of the world, being located near North Cape, in 70° north latitude. Mining lands, 328 claims, patented, area 340 acres, also 60-acre millsite and 2,000 acres of miscellaneous lands, in the Kaafjord district. Property shows about 30 fissure veins of copper and iron pyrites, 12 of which are more or less developed, these averaging 10' width and 3,000' length, carrying sulphide ores averaging about 2% copper. Has 8 tunnels,

seven crosscut and one in ore, these ranging from 150' to 2,500' in length, with a total of about 15,000' of underground openings, exposing about 600,000 tons of ore, with about 100,000 tons blocked out for stoping. Mine was opened 1821, closed 1873, and reopened 1895 by present owner. Mine is 300 miles from a railroad, but only 300 feet from the sea, by which shipments are made and received. Equipment includes hoists, air and diamond drills, electric light, etc. Power is supplied by a Pelton wheel fed by a 1,000' waterfall. New concentrator has 100 tons daily capacity. Annual production is about 30,000 tons of raw ore which is concentrated into 2 grades, first averaging 12% copper, and second 4% copper and 50% sulphur. Property is energetically managed, with excellent results.

GEWERKSCHAFT ALTFALTER.

GERMANY.

Mine office: Altwalnau, Hirschberg-Grossalmerode, Hessen-Nassau, Germany. Has copper-lead ores, developed by one shaft, and employs about 30 men.

ALVERDSKI GROUP.

RUSSIA.

Mine office: Alverdski, Bortschalo, Tiflis, Russia. Said to be owned by a French syndicate. Is a new property of considerable promise, with vigorous management. Production in 1903 was approximately 2,000,000 lbs. refined copper, with promise of a considerable future increase.

AMADOR CONSOLIDATED MINING & DEVELOPMENT CO. MONTANA.

Office: 507-172 Washington St., Chicago, Ill. Mine office: Iron Mountain, Missoula Co., Mont. Joseph Sherlaw, president; D. E. Mackinnon, secretary; Robt. M. Mahler, treasurer. Organized March 16, 1903, under laws of Arizona, with capitalization \$10,000,000, shares \$5 par, as a reconstruction of the Amador Copper & Gold Mining & Milling Company, to secure additional funds necessary for development. Lands, 18 claims, area 355 acres, also 2 groups of patented placer-gold claims, area 180 acres, with 5 mill and smelter sites and 450 acres miscellaneous lands, showing 5 fissure veins in slates and quartzite, of which 3 veins said to be of 40' to 270' width are undergoing development, these giving oxide and sulphide ores, mainly chalcopryrite with a little chalcocite, said to assay 3% to 34% copper, 3 oz. to 16 oz. silver and \$6 gold per ton. Main ore body on the east drift of the 250' level is said to be 1,325' long and 35' wide, with 10' of sulphide smelting ore and about 20' of fair sulphide concentrating ore. Main shaft is 400', with tunnels of 187', 512', 632' and 662', estimated by company to show 365,000 tons of ore blocked out for stoping. Has a 2-mile flume and pipe-line, delivering water at mine under a 210' head. Has an air-compressor, 4 power drills, 2 hoists and 15 mine buildings and dwellings and a sawmill. Company plans building an 8-mile railroad to connect with the Northern Pacific at Iron Mountain, 8 miles from the mine. Company has refused for past 3 years to permit anyone but workmen to inspect its mine, hence information as to the large ore bodies rests solely upon the statement of the company and its engineers, paid for official reports. Company said to plan building a smelter.

AMADOR COPPER & GOLD MINING & MILLING CO.

MONTANA.

Reorganized, 1903, as Amador Consolidated Mining & Development Co.

AMALGAMATED COPPER CO.**MONTANA.**

Office: 42 Broadway, New York. Organized April 27, 1899, under laws of New Jersey, with capitalization \$75,000,000, increased in 1901 to \$155,000,000, shares \$100 par. Henry H. Rogers, president; F. O. Addicks, vice-president; A. H. Melin, secretary and treasurer; John D. Ryan, managing director. Directors are H. H. Rogers, Albert C. Burrage, Wm. Rockefeller, Fred P. Olcott, James Stillman, Anson R. Flower, J. D. Ryan and Geo. H. Church. Annual meeting, first Monday in June. Registrars, Central Trust Company of New York and National Shawmut Bank of Boston; transfer agents, National City Bank of New York and Kidder, Peabody & Co., of Boston.

The Amalgamated is not a mining company, being merely a securities holding corporation, with assets consisting of stock in sundry subsidiary companies. Stock of the following named corporations is entirely owned by the Amalgamated, with the exception of the few founders' shares, required to be in the names of directors: Washoe Copper Co., capitalization \$5,000,000; Colorado Smelting & Mining Co., capitalization \$2,500,000; Diamond Coal & Coke Co., capitalization \$1,500,000; Big Blackfoot Milling Co., capitalization \$700,000. In the following named corporations the Amalgamated holds from practically the entire issue, as in the case of the Boston & Montana, to a majority interest only, as in the Anaconda: Boston & Montana Consolidated Copper & Silver Mining Co., capitalization \$3,750,000; Parrot Silver & Copper Co., capitalization \$2,298,500; Butte & Boston Consolidated Mining Co., capitalization \$2,000,000; Anaconda Copper Mining Co., capitalization \$30,000,000. The Hennesy Mercantile Co., capitalization \$1,500,000, was sold to D. J. Hennesy in 1904. The stores were immensely profitable, but highly unpopular, and the Amalgamated, with all its faults, seems desirous of earning and holding the good will of employees by treating them fairly and paying them well. The Amalgamated also is credited with owning a controlling interest in the United Metals Selling Co., but in all likelihood the control is held by Amalgamated officers, rather than by the company, it being the custom of adepts in "high finance," among whom the officials of the Amalgamated stand well to the front, to "hold out" a few "good things"—and the United Metals Selling Co. pays exceptionally good dividends. The Amalgamated is said also to have taken a bond and lease on the Indian Queen mine, at \$125,000, from the Western Mining Co., in December, 1904. People prominently connected with the Amalgamated are heavy holders of shares of the Utah Consolidated and Greene Consolidated, and the Amalgamated is popularly credited with a hankering to secure control of either or both of these fine mines.

The Amalgamated had 13,801 shareholders at its annual meeting in June, 1904, of whom nearly all are residents of Boston and vicinity, where investors are supposed to know better. The annual meeting in question, by the way, was a howling farce, held at the nominal headquarters in New Jersey. Not a single officer was present, a cheap clerk running the proceedings. A shareholder who "wanted to know, you know" was not given even the consideration accorded Oliver Twist when he asked for more, but

was ignored. The utterly putrid corporation laws of New Jersey lend themselves most admirably to this sort of finance, and the thrifty citizens of that state congratulate themselves upon having no taxes to pay. The big corporations with things to conceal are willing to pay for "protection," just as the demi-monde pay hush-money to the police in some towns.

The company began the payment of regular quarterly dividends of 1.5% immediately after its organization, these regular dividends being supplemented by extras of $\frac{1}{2}\%$ quarterly, giving an annual return of 8%, until October, 1901, when the extra dividend was dropped, the regular quarterly dividends being reduced to 1% in January, 1902, and to $\frac{1}{2}\%$ in May, 1903, or at the rate of 2% yearly, where they have since remained, but the net income of the company was more than double the amount in 1904, and the first dividend of 1905 was paid on a basis of 4% annually.

The force employed by the various corporations subsidiary to the Amalgamated is about 13,000 men, mainly at Butte, Anaconda and Great Falls, Montana. In addition to its mines, mills and smelters, the Amalgamated owns most of the daily newspapers in Montana, but the profits of one, the leading newspaper of the state, are eaten up by the losses on others of its subsidized publications.

The Amalgamated was formed, six years ago, to acquire control of the copper industry of the world. This ambitious plan was modified a little later to acquiring control of the American copper industry. After 6 years of effort the corporation does not yet control the copper industry of Montana alone. Litigation with the Heinze interests, conducted through various subsidiary corporations, is protracted and costly. The management of the Amalgamated has been guilty of a series of tactical blunders, the greatest of which was the maintenance of artificially high prices for copper until nearly the close of 1901, followed by an attempt to cut the price of the metal in two, failure following both attempts. The management has learned, however, by its past errors, and is now conducted along more prudent lines. John D. Ryan, the new managing director, is a man of exceptional executive ability. This has been proven by the work done during 1904, when distinct gains were scored in many directions. The Amalgamated also has the benefit of the services of some of the best mining men and metallurgists to be found anywhere, in charge of its subsidiary mining corporations. The 1904 production of the mines controlled by the Amalgamated was about 240,000,000 lbs., of which the Amalgamated's share was not less than 180,000,000, made at an average cost of about $9\frac{1}{4}$ cents, and sold at an average price of about $13\frac{1}{4}$ cents, giving mining profits of about \$7,000,000, or a little better than \$4.50 per share, in addition to which there were considerable profits from various subsidiary industries.

An alleged exposé of the Amalgamated has been running as a serial in a monthly magazine since August, 1904. This work of fiction, written by a Boston broker named Lawson, of more than shady reputation, has been accepted as gospel truth by many unsuspicious readers, who imagined that they were being given a glimpse behind the scenes. These articles were

notable mainly for two things—i. e., what they promised to tell, and what they did not tell. The broker in question was responsible for the very shadiest parts in the shady Amalgamated history. He had his share of the booty, and now “peaches” because his “pals” will not divide over again. The Copper Handbook has criticised the Amalgamated in very plain language since the organization of the corporation, but it is only justice to the Amalgamated to state that the management of the company, while far from perfect, is upon a sounder and fairer basis than ever before. The “exposer” of Amalgamated, is the man who did the dirty work that was too stenchful for Rogers and his associates. He was paid for it once or twice, but the Amalgamated refused to pay three times—hence the “disclosures” of the virtuous Lawson—himself the owner of a mining company yecept Trinity, compared with which the Amalgamated shines like an electric light alongside a putrescent mackerel.

AMALGAMATED GOLD & COPPER CO.

ARIZONA.

Dead. A Douglass-Lacey flotation, formerly located at Huron, Yavapai county, Arizona, where a 300' shaft was sunk.

Douglass, Lacey & Co. have been operating for the past five years or so one of the largest and cleverest mining swindles ever known in the United States. Sumptuous offices are maintained at 66 Broadway, New York, and about forty branch offices have been established in various cities of the United States and Canada. A number of honest men have been drawn into the scheme by baits of alluring commissions, and have peddled the rotten shares of this firm of stock-jobbers among their friends and neighbors, to the loss of their own peace of mind and reputations. The plan of the Douglass-Lacey swindle is neat and comprehensive. The firm announced that it would operate on the law of averages, and by handling many mines the good ones would make up for the failures. Considerable bluffing has been done in the way of crude mining operations, but none of the “mines” have proven successful, and none are likely ever to be successful.

This firm of sharpers begun paying dividends on shares, when no profits were earned, for which they should be jailed for the common swindlers that they are. Stock in the worthless companies was exchanged for stock in equally worthless companies whenever shareholders grew tired, and the victims of the conspiracy were tolled along by the “dividends” paid out of the money they had themselves furnished. For the past year—or since the last annual issue of the Copper Handbook, exposing the utter rottenness of this firm and its promotions—cash dividends have been suspended, and “scrip” dividends substituted therefor. It is reported that this firm has bilked something like 16,000 small investors, in the United States and Canada, to the tune of several millions of dollars.

The manner in which this firm of swindlers has muzzled the financial and mining press by the placing of its advertisements is no credit to the American trade press. Just two publications have exposed this concern, and called a spade a spade. One was the Mining & Engineering Review of San Francisco—to whom all honor—and the other was the Copper Handbook.

GEWERKSCHAFT VER. AMALIA- UND KNOTTENBERG. GERMANY.

Letter returned unclaimed from former mine office, Mornshausen an der Dautphe, Hessen-Nassau, Germany. Adolph Freund, president; Paul Marcus, engineer; capitalization, 1,400,000 marks. Has cupriferous silver-lead ores, opened by one shaft. Presumably idle.

AMARANTH GOLD MINING CO.**ARIZONA.**

Mine office: Maxton, Ariz. S. J. Goldie, superintendent. Lands, 14 claims, including the Stormcloud. Ores carry gold, silver and copper. Has steam power.

AMAZON GOLD CO.**MEXICO.**

Office: 507 Commercial Bldg., St. Louis, Mo.; Mine office: Chacala, Sinaloa, Mex.; Jas. T. Dugan, president; Edward B. Sowers, manager; J. S. Wilkinson, superintendent; J. E. Arnold, assistant superintendent. Ores carry gold, silver and copper. Equipment includes a Bryan mill and 10-ton smelter. Company said to plan installation of modern smelter of fair size. Employs 100 to 125 men.

AMERICA-BRITANNIA MINING CO.**WASHINGTON.**

Mine office: Baring, King Co., Wash. C. Campbell, superintendent, at last accounts.

AMERICAN CONSOLIDATED COPPER CO.**NEW MEXICO.**

Office: 44 East Broad St., Columbus, Ohio. Mine office: Santa Fé, Santa Fé Co., N. M. Organized 1901, under laws of New Mexico, with capitalization \$5,000,000, shares \$1 par. Adelbert R. Gibson, president and general manager; D. A. Walker, vice-president and treasurer; W. B. Randall, secretary; E. A. Johnson, receiver. Lands, 32 claims, area 640 acres. Property is in 5 groups, all in New Mexico. The Atwood group of 6 claims is in the Shakespeare district of Grant county; the Don Bernardo group of 14 claims is in the White Signal district of Grant county; the Sunlight group of 4 claims is in the San Andreas district of Socorro county; the El Paso-Rock Island group of 4 claims is in the Gallinas district of Lincoln county, and the Copper Age group of 4 claims is in the Los Cerrillos district of Santa Fé county. Work has been done on all 5 groups, with principal operations on the Atwood group. These various properties show 8 fissure veins, of which the 3 principal range 4' to 70' in width, with estimated average values of 12% copper, 5.5 oz. silver and \$14 gold per ton, mainly from oxide and sulphide ores, with a limited quantity of carbonates. Has 11 shafts of 40' to 100', with 3,000' of underground openings and about 60,000 tons of ore blocked out for stoping. Has steam power and a 50-ton concentrator. Has experimented with various leaching processes for the lixiviation of large bodies of low-grade ore. Property is in the hands of a receiver with very ugly charges made by shareholders against Gibson and his associates, who are pictured as scoundrels. While charges of shareholders remain to be proven, there is no question as to their having a considerable basis of fact.

AMERICAN CONSOLIDATED MINES CO.**NEW MEXICO.**

Office: 23 Postoffice Bldg., Colorado Springs, Colo. Mine office: Twining, Taos Co., N. M. Employs 12 men. J. Shumaker, president; C. D. Weiner,

secretary and treasurer; O. H. Stanley, general manager; E. H. Souther, superintendent. Organized November, 1901, under laws of New Mexico, with capitalization \$3,000,000; shares \$1 par. Lands, 19 claims, area 380 acres, also a 5-acre millsite and half interest in 380 acres of timber lands, in the Rio Hondo and Lake Fork districts. Has secured assays of 3% copper and \$16 gold per ton from ores cut in 3 tunnels, longest 510'.

AMERICAN COPPER CO.**ARIZONA.**

Office: 11 Broadway, New York. Mine office: Val Verde, Yavapai Co., Ariz. Organized under laws of Arizona, with capitalization \$5,000,000, shares \$1 par. Employs about 100 men. J. K. Burnham, president; A. S. Kimberley, secretary and treasurer; Benj. Blanchard, superintendent. Lands, 20 claims, area 400 acres, including the Iron King mine, in the Big Bug district. Has 7 shafts, deepest 100', 210', 250', and 385', with about 5,000' of underground openings, showing a large ore body, estimated to give 350,000 tons averaging \$10 per ton of ore blocked out for stoping. Principal values are in gold and silver, with lead and copper as by-products. Has steam power and 6-stamp mill, stamps being fitted with 1,000-lb. shoes and having quadruple discharge, mill having a daily capacity of 40 to 50 tons. Has a 50-ton cyanide plant and is said to plan building a 500-ton concentrator and smelter, to cost \$250,000. Has electric light, steam and water power, necessary mine buildings, dwellings for workmen, store and combination church and school building. Company seems well managed and prosperous.

AMERICAN COPPER CO.**WYOMING.**

Office: 327 Pine St., Williamsport, Pa. Mine office: Holmes, Albany Co., Wyo. Employs 15 to 20 men. Thos. M. B. Hicks, president and treasurer; Otto C. Clinger, secretary; LeRoy Scholl, superintendent. Organized Aug. 23, 1902, under laws of Wyoming, with capitalization \$1,000,000, shares \$1 par. Lands, 5 claims, area 100 acres, in the Douglas Creek division of the Encampment district, showing a fissure vein in granite, 20' wide at depth, and composed of three distinct layers, first being porphyritic, with width of 6' to 7' and carrying about 1.5% copper and \$7 gold per ton, with some covellite assaying 60% copper and \$20 gold per ton; second layer of 6' to 7', of jaspelite and diorite, carries decomposed iron ore assaying \$20 to \$150 gold per ton; the third layer is brecciated, carrying oxide, carbonate and sulphide ores of copper, with quartz gangue. Has a 3-compartment main shaft 100' deep, planned to be sunk to 1,000', also other shafts of 50', 60' and 160'. Has a 100-h. p. steam equipment, with Norwalk air compressor, power drills and necessary mine buildings. Property regarded as promising and company is one of the most vigorous in the Wyoming copper fields.

AMERICAN COPPER MINING CO.**NEW JERSEY.**

Office: 20 Broad St., New York. Mine office: Somerville, Somerset Co., N. J. Organized 1885, under laws of New York, with capitalization \$500,000, shares \$1 par. Josiah C. Reiff, president; W. S. Chapman, secretary; Josiah Bond, general manager; John T. Downey, mine superintendent. Lands, mining rights to about 1,000 acres and a 50-acre millsite owned in fee. Ore occurs as blanket veins between trap and shale, these having an

average thickness of 2' and being traceable nearly 4 miles, carrying an estimated minimum average of 2% to 2.5% copper, with small gold and silver values. Native copper occurs at depth, with various oxides and carbonates above, in a gangue of altered shale. Mine is opened by 3 inclines of 155', 450' and 1,300', also a 500' crosscut drainage tunnel. Has steam power, with 30-h. p. hoist, 5-drill Rand air-compressor and drills, tramway and necessary mine buildings. The concentrator is of wood and stone, with daily capacity of 50 tons, having 2 rolls, screens, crushers and 2 Wilfley tables. Product, when mine is operated, is turned out as concentrates, shipped to smelters on New York harbor.

AMERICAN COPPER MINING CO.

Office: 4 Campau Bldg., Detroit Mich. John Baker, president and general manager. Location of property, if any, unknown.

AMERICAN COPPER MINING CO.

A "snide" concern; former office at 40 Wall St., New York. Possibly same company as the one having its office in Detroit.

AMERICAN COPPER MINING & EXTRACTION CO.

COLORADO.

Office: 828 Equitable Bldg., Denver, Colo. Owned the Gardiner copper leaching and precipitating process, in use at the Denver plant of the Union Ore Extraction & Reduction Co.; process since sold to the Commonwealth Reduction Co.

AMERICAN COPPER MINING & SMELTING CO.

NEW MEXICO.

J. R. Kerr & Co., 555-11 Broadway, New York, "fiscal agents" of company, removed and left no address behind. Property was advertised as a developed mine, shipping ore to smelters, but was not found in New Mexico.

AMERICAN DEVELOPMENT CO.

ARIZONA.

Office: Wolvin Bldg., Duluth, Minn. Mine office: Bisbee, Cochise Co., Ariz. Henry B. Hovland, president; Thos. F. Cole, vice-president; Chas. d'Au-tremont, Jr., secretary and treasurer. Organized May 2, 1904, under laws of Arizona, with capitalization \$120,000, shares \$10 par, \$3 paid in, all issued. Lands, 9 claims, lying next east of the Junction Development Co. and Calu-met & Pittsburg Mining Co. Management is composed of men prominent in the Calumet & Arizona group. No development has been undertaken as yet, but the promising results secured at the Junction render it likely that attention will be given the American also, before the close of 1905.

AMERICAN EAGLE COPPER MINING CO.

WYOMING.

Mine office: probably Encampment, Carbon Co., Wyo. John Morris, manager. Is sinking a shaft and has secured specimens of good copper ore.

AMERICAN GOLD & COPPER CO.

ARIZONA.

Office: 401 Henne Bldg., Los Angeles, Cal. Mine office: Morristown, Maricopa Co., Ariz. A. B. Hall, superintendent; J. J. Hawkins, attorney. Capitalization \$1,000,000, shares \$1 par. Lands, about 100 acres, including Fitzhugh Lee, Joe Wheeler and Eddy mines. Has auriferous and argenti-ferous copper ore, extensively developed, with steam power and 10-stamp mill.

AMERICAN GOLD & COPPER MINING CO.**WYOMING.**

Office: 1431-79 Dearborn St., Chicago, Ill. Mine office: Jelm, Albany Co., Wyo. Albert L. Stone, president; J. C. Essick, secretary; Frank T. Wyatt, general superintendent. Capitalization \$5,000,000. Lands, 14 claims, held by location.

AMERICAN GOLD MINING CO.**COLORADO.**

Office: 304-411 Olive St., St. Louis, Mo. Mine office: Ouray, Ouray Co., Colo. Employs 40 men. W. C. Wrisberg, president and general manager; Ernest P. Olshausen, secretary and treasurer; V. A. Laughlin, superintendent; Ed. Wall, mine superintendent. Organized 1889, under laws of Colorado, with capitalization \$3,000,000, shares \$10 par. Has paid dividends of \$420,000. Lands, 13 patented claims, area 200 acres, including the American Nettie and West View mines, also 50-acre millsite, in the Ouray district. Country rocks are granite, shale and quartzite. Produces oxide and sulphide ores averaging 2% copper, 1% lead, 20 oz. silver and 20 cents gold per ton. Has 70,000' of underground openings, with large amount of ore blocked out and in sight. Has steam, electric and water power, with 40-stamp mill and concentrator, shipping concentrates to the Pueblo smelter.

AMERICAN GOLD MINING COMPANY**NEW MEXICO.****OF NEW MEXICO.**

Office: 312 Tacoma Bldg., Chicago, Ill. Mine office: Nogal, Lincoln Co., N. M. A. T. Anderson, president; John Monk, secretary; J. M. Rice, manager; M. D. Gaylord, superintendent. Operates the American, Helen, Old Abe and other mines, producing gold, silver and lead. Has steam and electric power, with a 50-stamp mill and 50-ton cyanide plant, and employs about 50 men.

AMERICAN-MEXICO MINING & DEVELOPMENT CO.**MEXICO.**

Office: 1009 Masonic Temple, Chicago, Ill. Mine office: Velardeña, Durango, Mex. Organized under laws of South Dakota, with capitalization \$3,000,000, shares \$1 par. Dr. W. S. Phillips, president; W. K. Graham, secretary. Lands, something under 10 pertenencias—or less than 25 acres—adjoining the Velardeña Mining & Smelting Co.'s property, carrying three narrow but rich veins, averaging 6" to 9" width only. Also has options on other mining lands. The company's mine, known as La Roca or Victoria, bought of Carlos Von Brandeis for \$60,000, is a good, small mine, but woefully inadequate to supporting the present top-heavy capitalization. Production is one carload of very rich ore monthly—no more, despite the bluster of the sharpers at the head of this company.

The company has a 60-ton smelter, and is building a new smelter of several hundred tons daily capacity, said capacity being sufficient to smelt a year's production in 24 hours. Company is paying 2% monthly dividends, which it is not earning.

AMERICAN MINES DEVELOPMENT CO., LTD.

Office: 506 Oneida Bldg., Minneapolis, Minn. P. R. Bailey, president; Jas. T. Manning, secretary, treasurer and manager. Claims to own and to

be developing copper, gold, zinc, lead and oil properties, but location of property, if any, unknown.

AMERICAN MINING CO.

IDAHO.

Mine office: Weiser, Washington Co., Idaho. Probably idle.

AMERICAN MINING CO.

UTAH.

Said to have promising claims near Mineral Springs, about 15 miles northwest of Death Canyon, in the Deep Creek district, opened by a 180' tunnel, from which several smelter shipments of ore of good grade were made during 1904.

AMERICAN MINING, MILLING & SMELTING CO.

Offices: care of Weston & Co., 10, Coleman St., London, E. C., Eng. "James Reid," president and treasurer; "H. Reid," secretary; "W. Matthews," general manager.

No person or publication is infallible, and the assumption of infallibility has been disclaimed expressly in the past and present editions of the Copper Handbook. It is with chagrin, however, that the author admits having been "taken in" by this cheap swindle in the last annual edition of this work. No other company given a good rating in Volume IV has been found otherwise than responsible, and none of the numerous companies denounced as fraudulent have been found otherwise than dishonest. To make such reparation as is possible to readers for the good rating erroneously but honestly given this rotten concern one year ago, it is now stated in the plainest possible language, that the American Mining, Milling & Smelting Co. is a rank swindle, incorporated under American laws, but feeding upon the gullability of the residents of Great Britain, where it is domiciled, under the wing of Weston & Co., a more than shady concern in London.

The company claims to possess mines in Alaska, Arizona, California, Colorado and Mexico. None of these alleged mines have been located. It is possible that the swindlers promoting these shares attempt to make a technical compliance with their assertions by holding worthless mining claims, which they call mines—but what's the difference?

This company is a swindle of the most rotten and barefaced sort, and every man connected with it is either a fool or a rascal.

AMERICAN PROSPECTING & DEVELOPMENT CO.

ARIZONA.

Office and mine: Bisbee, Cochise Co., Ariz. Lands, somewhere in the Mule Mountains, are said to show ore.

AMERICAN SMELTING & REFINING CO. NORTH & SOUTH AMERICA.

Office: 71 Broadway, New York. Organized April 4, 1899, under laws of New Jersey. Present capitalization is \$100,000,000, half common and half 7% cumulative preference shares. For fiscal year ending April 30, 1904, company showed net earnings of \$7,905,573, an increase of \$328,787 for the year, leaving a cash surplus of \$4,047,423, with assets of \$110,830,387. E. W. Nash, president; Danl. Guggenheim, chairman executive committee; Barton Sewell, vice-president; Isaac Guggenheim, treasurer; N. Suht, assistant treasurer; Edw. Brush, secretary; W. E. Moriss, assistant secretary; August Raht, mechanical engineer.

On May 1, 1903, the company had plants with an annual capacity for smelting 3,720,000 tons of ore, and refining plants capable of handling 340,000 tons of pig lead and 36,000 tons of blister copper yearly.

The company owns the following smelters: Germania Lead Works and Hanauer Smelting Works, Salt Lake City, Utah; a copper smelter at Murray, 9 miles from Salt Lake City, R. D. Rhodes, superintendent, new and modern throughout, with 2,000 tons daily capacity, having steam and electric power, and employing nearly 1,000 men; United States smelters, at Helena and Great Falls, Mont.; National Smelting Co., Chicago; Omaha smelter, at Omaha, Neb.; Grant and Globe smelters, Denver, Colo., Franklin Guiterman, manager; H. H. Alexander and C. H. Livingstone, superintendents; Pueblo Smelting & Refining Co., including the Eilers plant, Geo. A. Harsh, superintendent, the Philadelphia plant, S. C. Hazelton, superintendent, and the Pueblo plant, W. H. Howard, superintendent, all at Pueblo, Colo.; San Juan smelter, Durango, Colo.; Bi-Metallic smelter, Leadville, Colo.; Pennsylvania lead smelters, Salt Lake City, Utah, and Pittsburg, Pa.; Chicago and Aurora smelters, Chicago and Aurora, Ill., and Leadville, Colo.; Kansas City smelters, Kansas City, Mo.; El Paso smelters, F. C. Earle, superintendent, El Paso, Texas; Guggenheim smelters, Pueblo, Colo., Monterey and Aguascalientes, Mexico, latter with 2 new 300-ton convertible furnaces, for use interchangeably on lead and copper ores; Guggenheim Refinery, Perth Amboy, N. J.; El Carmen smelters, El Carmen, and Sierra Mojada, Chihuahua, Mex.; Velardeña smelter, Velardeña, Durango, Mex.; Playa Blanca smelter, leased from Compañía Minera Huanchaca, Willard S. Morse, general manager, at Antofagasta, Chile. The company is interested extensively in Mexican mines of lead, silver and copper, operated to feed its smelters. This is much the largest smelting corporation in the world, and is managed with signal ability and success.

AMERICAN ZINC EXTRACTION CO.

ARIZONA.

Mine office: Tucson, Pima Co., Ariz. Lands include the San Xavier mine, with ores of silver, lead and copper. Has steam power. Probably idle.

AMPARO MINING CO.

MEXICO.

Office: Philadelphia, Pa. Mine office: Etzatlan, Jalisco, Mex. Capitalization \$3,000,000, shares, \$1 par. Ferdinand Sustersic, general manager. Property is El Cusco, Santo Domingo and adjoining mines, said to have small pockets of rich ore carrying gold, silver, lead and copper. Property also shows large bodies of low-grade concentrating ore, of which considerable has been mined. Company plans installation of large cyanide and concentration plants.

AMY C. MINE.

COLORADO.

Mine office: Idaho Springs, Clear Creek Co., Colo. John Owen, owner; Geo. Riley, superintendent. Ores carry gold, silver lead and copper. Has steam power.

AMYGDALOID MINE.

MICHIGAN.

Office: care of J. F. Carey, Escanaba, Mich. Lands, 2,240 acres, in

Keweenaw county, Michigan. Has 6 shafts and 7 levels, and has produced 770 tons, 180 lbs. of refined copper. Idle since 1874.

ANACONDA MINE.

NEW MEXICO.

Mine office: San Pedro, Santa Fé Co., N. M. Carruthers & Field, owners and managers. Ores carry gold, silver, lead, copper and zinc. Has steam power and is said to have a small smelter.

ANACONDA CONSOLIDATED COPPER MINES AND SMELTING WORKS.

Sold to Murrin Copper Mines, Ltd.

ANACONDA COPPER MINING CO.

MONTANA.

Office: 42 Broadway, New York. Mine office: Butte, Silver Bow Co., Mont. Is the second largest copper producer of the world, employing about 5,000 men, under normal circumstances. Is controlled by the Amalgamated Copper Co. Organized June 18, 1895, under laws of Montana, with capitalization \$30,000,000, shares \$25 par. Henry H. Rogers, vice-president; W. H. Dudley, secretary; F. P. Addicks, assistant secretary; John Gillies, superintendent; D. W. Brunton, consulting engineer; Geo. D. Case, smelter superintendent; W. L. Bull, A. C. Burrage, H. H. Rogers, Wm. Rockefeller, W. G. Rockefeller, E. C. Bogert and W. W. Dixon, directors. Transfer agent, National City Bank, of New York. Annual meeting is in May. Stock is listed on New York, Boston and London stock exchanges. Dividend coupons are payable in England by the London Joint Stock Bank, Ltd., Princes St., E. C., with warrants to bearer issued in denominations of 5, 20 and 50 shares.

Operations for the three preceeding fiscal years ending June 1 are compared as follows:

	1902.	1903.	1904.
Gross yield per ton..... \$	10.66	\$ 10.48	\$ 10.95
Cost of mining per ton....	3.80	3.49	3.73
Cost transportation per ton.	.15	.15	.15
Cost of reduction per ton...	3.32	3.39	3.82
Paid for labor.....	3,860,789.00	5,269,005.35	4,322,657.00
Machinery and supplies....	3,148,705.00	4,311,570.61	3,102,137.00
Cost of marketing	2,052,105.00	3,207,151.67	1,929,353.00
Gross proceeds	10,498,953.00	14,597,852.14	10,761,473.00
Total expenditures.....	9,209,342.00	12,996,652.81	9,501,597.00
Net proceeds	1,289,611.00	1,601,199.33	1,259,876.00
Tons of ore treated.....	984,958	1,392,835	983,001

Dividends paid in 1904, were 50 cents each, in May and November, a total of \$1,200,000 for the year, giving total dividends paid by company to end of 1904 of \$24,450,000.

The Anaconda mine was opened in 1880, by J. B. Haggin, Marcus Daly and Senator Hearst, for silver. At a depth of about 150' the silver values decreased, being replaced by high-grade copper ores, principally chalcocite and bornite. The company's mines at Butte include the Anaconda, Never Sweat, St. Lawrence, High Ore, Green Mountain Consolidated, Bell and Diamond, which are regularly operated, also the Modoc, Wake-up-Jim and

other idle mines, including a number of mining claims of more or less prospective value, while miscellaneous landed holdings include sundry timber lands and coal mines. The country rock, known as the Butte granite, is basic, with an intrusive acid rock known as the Bluebird granite, a quartz-porphry being the third rock of the series in age, the entire rock mass being shattered by fissures carrying argentiferous and auriferous copper ores. The ores are mainly sulphide, largely chalcocite and bornite, with some chalcopyrite and a large percentage of enargite, which is an arsenide of copper, the ores having a gangue of quartzite and decomposed country rock. The oxide and carbonate ores usually found near surface in copper mines are not frequent in the Butte district, the granitic country rock being unfavorable to their formation. Like the veins of all other known mining fields, the Butte ores grow leaner with depth, but the lowest openings show ore bodies of great persistence and strength, carrying enormous quantities of disseminated ores running 2% to 6% in copper. Sufficient medium and low-grade ore is developed to enable the Anaconda to produce 75,000,000 pounds or more of refined copper annually for many years to come. A considerable number of stopes of high-grade ore remain untouched, but these are not in sufficient number to greatly raise the average percentage of the ores remaining unmined. Ores smelted give an average return of about 65 lbs. of copper per short ton, or 3.25% copper, with 3 oz. silver and average values of \$1.75 to \$2 gold and silver per ton.

Of the Anaconda company's mines, the Anaconda proper employs 600 to 800 men, having a 3-compartment 1,800' main shaft, timbered with 10x10" square sets, with good ventilation and about 30 exits, connected underground with the Never Sweat, Bell and St. Lawrence mines. Eight-ton skips are swung under double-deck cages worked in counterbalance. The Never Sweat has a 2,200' main shaft, with a 3,000-h. p. hoist, and employs about 500 men. The St. Lawrence has a 2,000' three-compartment main shaft, with 22 exits, employing about 700 men, normally. This mine has been on fire since 1890. The fire is in an extensive area above the 300' level, and is fought constantly. To prevent or retard its spreading, solid masonry bulkheads are built to cut off its progress. A complete fire fighting brigade is kept constantly on duty, working regular 8-hour shifts. The mine water of the St. Lawrence carries 9 to 13 lbs. copper per ton, and part of the copper contents are precipitated underground on scrap-iron in concrete sumps, and the water again leached on surface, which it reaches carrying only 2 to 4 lbs. of copper per ton. The High Ore mine employs 200 to 300 men, and has a 2,300' three-compartment main shaft, the deepest in the camp. This shaft unwaters nearly all of the Anaconda mines, having 7 powerful pumps, 3 on the 1,000' level, 2 on the 1,600' level and 2 on the 2,300' level, the central station on the lower level caring for the water from the Anaconda, Parrot and Washoe mines. The water forked from this shaft goes to a big precipitating plant in the gulch back of Meaderville. The pumping capacity of the plant is equal to raising 4,000 gallons of water per minute, from a depth of one-half mile. The main shaft of the Diamond is about 2,000' deep, and employs about 300 men, nor

mally. The Mountain Consolidated has a 2,100' main shaft and employs 150 to 300 men. The Green Mountain has a 2,200' three-compartment shaft and employs about 200 men. The Bell has an 1,800' main shaft and employs 300 to 500 men when fully working. The Buffalo employs a small force only. The Modoc, not working, has millions of tons of low-grade ore, running 1% to 1.5% in copper, which cannot be worked profitably under present conditions. But little sinking has been done in the deeper mines of the Anaconda for some years past.

Electric power is used extensively. The generating plant is at Canyon Ferry, 70 miles distant, and the current is wired to the mine with a primary voltage of 50,000, reduced to 2,000 volts at the transformer station, just outside of Butte, power being distributed to the various shafts and buildings from a main station at the Never Sweat. The principal dynamo is of 800-h. p., and drives a large duplex air-compressor. A three-phase dynamo, driven by the Canyon City current, furnishes the motive power for a direct-current generator that replaced an extensive underground haulage plant actuated by compressed air. Many electric lights are also used underground, being employed wherever possible. A large number of minor motors at the various buildings of the surface plant are driven electrically, using a 440-volt current.

Although title to the reduction plant stands in the name of the Washoe Copper Co., it is described at length in this article on the Anaconda, because it treats mainly Anaconda ores and is commonly known as the Anaconda smelter. The plant is leased to the Anaconda company for 9 years. This monstrous plant occupies a site of 225 acres on Washoe Heights, in the outskirts of the city of Anaconda, 35 miles by rail from the mines, and was planned by Frank Klepetko, and built and equipped with the able assistance of Messrs. Repath and Gulberg, and the late Messrs. R. G. Collins and Wm. F. Evans. Ground was broken May, 1900, and smelting begun February, 1902. The plant has an actual capacity of 6,000 tons of raw ore daily, and has no peer in the world. The monstrous size of the plant is shown by the material required in its construction, this including 20,000 tons of structural steel, 50,000 cubic yards of masonry, 25,000,000 feet of lumber and 1,000 car-loads of brick, in addition to which 300,000 cubic yards of excavation were required.

The concentrator covers 7 acres and is built on stone foundations, in two parts, each 255x355', connected by a power-house between. Each part contains 4 complete sections, and a description of one section gives a description of the entire concentrating plant, when multiplied by eight. Each section has one 24x24" Blake crusher, reducing ore to 3" size, this passing over two sets of trommels for sizing, oversize material going through two 5x15" crushers, which reduce it to 1½" size. Two belt elevators take the material on the main sizing-floor to a series of trommels for coarse-sizing, oversize going to coarse jigs, which produce coarse concentrates for the blast furnaces. The waste from the coarse jigs goes to two sets of 15x40" rolls for crushing, and is thence elevated and rejigged. In the jigging depart-

ment all undersize material from the crushers is treated automatically. Each jigging section has 36 double Evans jigs, set in three double rows, with Evans hydraulic classifiers, making three sizes of concentrates, which go to the storage bins, while the middlings go to the middlings department, which has two sets of 15x40" rolls, crushing material to about 1¼" size, which goes by belt elevators to 4 sets of trommels, from which the undersize goes automatically to 4 hydraulic classifiers which feed 18 double Evans jigs, set in a triple row. The process is the same as in the jigging department and the concentrates from the middling department are mixed with the concentrates from the jigging department and go thence to storage bins. The middlings are collected in launders and taken by elevators to the regrinding department, which has four 5' Huntington mills, 18 double Evans jigs and 4 hydraulic classifiers. The Huntington mills are fed from V-shaped tanks, the ground material passing through 1¼" screens to hydraulic classifiers, thence to the jigs, both concentrates and tailings being carried by water in launders and elevators. The slimes department has 35 Wilfley tables, fed from the bottom of V-shaped tanks, concentrates going to storage bins, 24x65' and 70' high, in two sets of upper and lower bins. The concentrator also is supplied with slum ponds. It is planned to enlarge the concentrator during 1905. The Anaconda's concentrating ore carries an average of 4% copper, 1 oz. to 6 oz. silver and 0.01 oz. to 0.02 oz. gold, 16% iron oxide, 17% sulphur and 55% silica. The tailings carry an average of 0.8% copper and 90% silica.

The sampling mills, 42x60' and 5 stories high, are of brick and wood, in 2 double sections with a daily capacity of 600 tons each, equipped with Brunton samplers giving a final sampling of 3.2 pounds from each short ton of ore.

The roasting department is of steel, on stone foundations, 98x320', with a height of 50' from ground floor to calcining floor. This building contains 48 McDougal calcining furnaces, each 28' high and with 6 roasting hearths and 3 platforms, hopper-cars delivering concentrates to hoppers with automatic feeds, each roaster having a daily capacity of about 40 tons. No coke is required except for the preliminary heating, the sulphur furnishing all fuel required after the charge is thoroughly ignited. Each furnace has an automatic discharge into two storage hoppers, these keeping the calcined ores hot until taken out to reverberatory furnaces. The building has sheet iron flues that take the fumes into a dust-chamber 40x300' and 40' high, this having concrete inner walls and a floor of steel hoppers. It is planned to increase the roasting department during 1905, by adding 40 new McDougal calciners, an increase of five-sixths over present capacity.

The power-house of the concentrator plant, 136x150', standing between and connecting the two halves of the concentrator building proper, is of steel, with brick walls, having three 15-ton traveling cranes of 44' span and contains a 1,500-h.p. Allis-Chalmers engine and two triple expansion 2,000-h.p. Nordberg engines, the latter using rope transmission. The boiler-room contains ten 300-h. p. Stirling water-tube boilers. The electric machinery

consists of two 700-kilowatt 2-phase Westinghouse generators, one 500-kilowatt generator and three 125-arc-light generators, the latter furnishing light for the city of Anaconda as well as for the plant.

The reverberatory furnace building is of steel, 184x518', and contains 14 furnaces, each 24x54', set in two rows. Each furnace, of 120 tons daily capacity, has five charging-hoppers and one coal-hopper, fed from hopper-cars, the feeding of both fuel and calcined ore being strictly automatic. The matte is drawn off into 20-ton ladle cars and taken to the converter. The slag is skimmed into boxes overflowing into running water, and the granulated slag is washed through launders to the slag-dump. Fumes from the reverberatories are taken through underground flues, one for each row of furnaces, to the main flue. It is planned to double the capacity of this department during 1905.

The blast furnace department is a 3-story steel building, 82x200', the first floor carrying the railroad tracks, while the second story is the main operating floor, and the third is the charging floor. There are five furnaces, each 56x180' and 40' high, with a daily capacity of 400 tons each. Cupolas are made of cast-iron plates, bolted, with 12 special water-jackets hung from steel beams, each furnace having 32 five-inch tuyeres. The charging floor has railroad tracks on each side of the furnaces, side-dumping hopper-cars being handled by compressed-air locomotives. The charging doors of the furnace extend full length, and are opened and closed by compressed-air pistons, and all charges fed automatically. In front of each furnace is a 16' settler, receiving a continuous flow of molten matte and slag, the matte being drawn from the bottom into 20-ton ladle cars, and taken thence to the converters. The slag overflows into sluices and after granulation by water is washed to the slag dumps. Overhead sheet-iron flues carry off fumes and smoke into a dust-chamber which is an exact duplicate of that in the calcining department. The product of the first fusion is a 44% matte, and the slags carry an average of 0.2% copper only.

The converter building is 137x416', of steel, with two 60-ton electric traveling cranes of 60' span each, for handling converters and ladles, and two smaller electric traveling cranes for the converting and casting departments. There are 2 reverberatory storage furnaces for the receipt of matte from blast furnaces, these being available for smelting, if desired. There are 8 stands of converters, each converter being 8' in diameter and 13' long with eighteen 1¼" tuyeres and ball-closing valves. There are devices for tilting the shells in stands, and cranes for handling them when out of stands. The converters blow off into hoods with flues leading to a dust-chamber similar to those already described. The matte is blown up to low-grade blister copper, and poured into ladles carried by cranes to three 70-ton casting-furnaces, which turn out anodes assaying about 97% copper and 80 oz. silver per ton. The anode moulds are on traveling carriages actuated by hydraulic power, pigs going automatically to water-cooling tanks, while the slag goes to a casting machine and is made into slag-brick. The lining department has a full outfit of machinery, largely automatic, for mixing

linings for the converters, and these linings are tamped into place by ingenious machinery especially devised for the purpose. In 1904 low-grade silicious ore was substituted for barren silica in converter linings, effecting a saving estimated at \$600 per day, or about \$180,000 per annum.

The briquetting department has 2 machines of 100 tons daily capacity each, with dryers and conveyers. After briquetting, the flue-dust goes to the smelter for reduction. The blister copper is refined electrolytically, producing electrolytic copper assaying 99.5% copper, with traces only of arsenic and antimony.

The power-house of the smelting department, 80x500', of steel and brick, has a 15-ton electric traveling crane of 500' reach. The boiler-house has eighteen 300-h. p. Stirling boilers and about 4,000-h. p. is generated from the waste gases of the reverberatory furnaces, effecting an enormous saving in fuel costs and stoking charges. There is a Nordberg triple expansion engine with capacity to compress 20,000 cubic feet of free air per minute to a pressure of 13 pounds per square inch, also 4 Nordberg compound engines direct-connected with Connersville blowers having capacity to compress 30,000 cubic feet of free air per minute, delivered to the blast furnaces at a pressure of 2 pounds per square inch. There are also 3 smaller compressors, for locomotives and air lifts. The plant is served by compressed air locomotives, charged at an initial pressure of 900 lbs. to the square inch.

The smelter formerly discharged into the air about 2 tons of arsenic and scores of tons of sulphur daily, causing enormous damage to the ranchers in the Deer Lodge valley. The Anaconda company paid damages exceeding \$150,000 in settling 130 cases, and to obviate depopulating this fertile valley erected a new flue and smokestack in 1903. This stack is 300' high, with an inside diameter of 33' 4" at the bottom and 30' at the top, built of 3,000,000 brick, and 4' 6" thick at the bottom. Connecting the smelter and stack is a flue 60' wide and 36' high, 2,170' in length, and 5,500' long with connections, under which is a tunnel 7' high and 55' wide. The trouble from arsenical sulphur fumes while not entirely overcome, has been greatly mitigated by the new flue and stock, and incidentally the improvement is proving an excellent thing for the company. About 175 tons of flue dust is secured daily of which about 60 tons are treated in a newly built arsenic refinery, the residue being re-smelted after the extraction of its arsenical contents. As the waste fumes from the big stack carry off enough sulphur to make about 2,000 tons of H_2SO_4 daily, a sulphuric acid plant may be the next addition to the works.

The big reduction plant treats about 5,500 tons of ore daily and employs about 1,800 men, distributed as follows through the various departments: Concentrator, 350; reverberatory, 200; calcining, 150; converter, 150; casting, 60; briquetting, 50; various shops, surface men, etc., 950.

The copper refinery was closed August, 1903, since which time all refining has been done on the Atlantic seaboard, by the Baltimore Smelting & Refining Co. The Washoe plant saves the Anaconda company upwards

of one dollar per ton, in the treatment of its ores, and without it the Anaconda could not earn a decent dividend one year in four.

The Anaconda company operates a coal mine at Belt, Cascade county, Montana, F. W. C. Whyte, superintendent, which employs about 300 men. The company also owns a controlling interest in the Butte, Anaconda & Pacific Railroad, 35 miles in length, and operates a sawmill and other extensive enterprises, subsidiary to the mining and smelting of copper, among these being a big brickyard at Anaconda, which turns out enormous quantities of building, silica and fire-clay bricks for the company's use. Production of refined copper for the year ending June 1, 1903 was about 93,500,000 pounds, produced at a cost of 13.9 cents per pound with gold and silver values net, or at a cost of 11 cents per pound, deducting gold and silver values. For the calendar year 1904 the production of refined copper was about 95,000,000 lbs. Net earnings for the year ending June 1, 1904, were only \$1,259,875, being the smallest for many years and comparing with high-water net earnings of \$5,365,520 in 1900.

For many years the Anaconda was the world's largest producer of copper, and second largest producer of silver. The Boston & Montana now leads Anaconda in copper output and the Greene Consolidated, Rio Tinto and Calumet & Hecla are dangerously close competitors, with every prospect that the Copper Queen also will be a rival in 1906.

The local management of the Anaconda is of the best, but many stockholders are dissatisfied with the financial management, believing that the Anaconda is being bled by the Washoe, as the Amalgamated Copper Co. owns the Washoe outright, while holding but little more than a majority interest in the stock of the Anaconda.

ANACONDA MINING CO.

MONTANA.

Predecessor of the Anaconda Copper Mining Co., and still in existence.

ANACONDA PROPRIETARY COPPER, GOLD & SILVER MINE.

AUSTRALIA.

Succeeded by Melrose Copper Mines.

ANCHORIA COPPER MINING CO.

WYOMING.

Office: care of H. O. Granberg, secretary-treasurer, Oshkosh, Wis. Mine office: Copperton, Wyo. Organized, April, 1901, with capitalization \$1,000,000, shares, \$1 par. Hon. David H. Craig, president. Land, 4 claims, showing a 60' fissure vein carrying cuprite, melaconite and chalcopyrite, with 30" pay streak at bottom of 106' two-compartment shaft. Has steam power and is working steadily. Property considered promising.

ANDERSON GROUP.

CALIFORNIA.

In Riverside county, California. Anderson & Co., owners. A group of 26 claims, with vein 2' to 6' wide, carrying argentiferous copper ore.

ANDERSON MINING CO.

BRITISH COLUMBIA.

Mine office: Alberni, Vancouver Island, B. C. J. C. Anderson, president. Has steam power and limited mining development. Probably idle.

ANDES COPPER MINING & EXPLORATION CO., LTD.

CHILE.

Offices: 4, Sun Court, Cornhill, London, E. C., Eng. Wm. B. Brodrick,

chairman; W. E. Singer, secretary. Capital, nominal, £90,000; issued, £6,707. Has mining lands in Tarapacá, Chile.

SOCIEDAD BENEFICIADORA DE MINERALES ANDINA. PERU.

Mine office: Yauli, Junin, Peru. Has silver-copper ores.

ANDREWS GROUP.

ARIZONA.

Mine office: Stoddard, Yavapai Co., Ariz. J. J. Canovan, owner.

MINA ANDUEZA.

ARGENTINA.

Owned by Sociedad Francesca de Minas y Fundicion de Nonogasta.

ANGANG COPPER CO.

MEXICO.

Mine office: Chiranganguero, Zitacuaro, Michoacan, Mexico. Stock issue supposedly owned by Arimex Copper Co., a promotion of Thomas W. Lawson, of "frenzied finance" notoriety. Has a large body of medium-grade chalcopryrite, with a limited amount of development. Was worked on a very limited scale when operated and probably is idle.

ANGEL MINING CO.

ARIZONA.

Property has passed to Arizona Gold & Copper Mines Co.

**ANGLO-AMERICAN COPPER MINING COMPANY
OF PARRY SOUND, LTD.**

ONTARIO.

Office: 211 State St., Chicago, Ill. Mine office: Parry Sound, Ontario. Organized 1900, under laws of Ontario, with capitalization \$3,000,000, shares \$1 par. Isaac Block, president; Jacob Newman, Jr., secretary and treasurer. Lands are on Wilcox Island, near Parry Sound, showing veins carrying copper, silver, gold, cobalt and zinc, rendering ore exceedingly refractory. Company estimates average ore values at 20% copper and 10 oz. gold per ton, which is either a mistaken statement or worse. Idle. Has one shaft, 125' deep. Mine could be operated open-cast.

ANGLO-AMERICAN GOLD & COPPER CO.

MEXICO.

Office and mine: La Cananea, Sonora, Mex. Organized under laws of Arizona and protocolized in Mexico, with capitalization \$4,000,000, shares \$10 par. W. H. Frost, president and general manager; A. F. Krohn, secretary; A. W. Arbuckle, manager. Lands, 360 pertenencias, area nearly 900 acres, in two groups. The Graciela group of 200 pertenencias, 28 miles south of Cananea, gives average assays of 15.5% copper, 36 oz. silver and \$6.75 gold per ton. The Enriquito group of 160 pertenencias, 6 miles south of Cananea, is claimed to be an extension of the Capote ore body of the Greene Consolidated, and shows ores assaying 17% to 30% copper. Probably idle.

ANGLO-AMERICAN GOLD & COPPER MINING CO.

Office: care of A. B. Wadleigh, secretary, Naco, Ariz. Location of property, if any, unknown.

ANGLO-CHILI CONCESSIONS, LTD.

CHILE.

Offices: 58, Lombard St., London, E. C., Eng. Geo. Flamank, secretary. Capital, nominal, £15,000. Claimed to have mining concessions in Chile.

ANGLO-CHILIAN EXPLORATION CO., LTD.

CHILE.

Offices: 85, Gracechurch St., London, E. C., Eng. Mine office: Canutillo, Huasco, Chile, J. M. Drysdale, secretary; I. H. Loram, mine manager. Capital, nominal, £20,000; issued £17,000, par £1.

ANGLO-ITALIAN COPPER SYNDICATE.**ITALY.**

Claimed to hold 12,000 acres of copper-bearing land near Genoa, Italy.

ANGLO-ROUMANIAN FINANCE & TRADING CO., LTD.**ROUMANIA.**

Offices: 31, Walbrook, London, E. C., Eng. Letter returned unclaimed from alleged local office. Baia Arama, Mehedinze district, Roumania. C. S. Matz, secretary. Capital, issued, £449,112. Lands said to be 20,000 acres, including copper properties and forests, held on 35-year lease from October, 1898.

ANGLO WESTPHALIAN COPPER CO., LTD.**GERMANY.**

Offices: 1-2, Great Winchester St., London, E. C., Eng. Organized, Aug. 29, 1904, to acquire copper mining property in province of Westfalen, Prussia.

ANGUS COPPER MINING & MILLING CO.

Office: 10 North Eighth St., St. Louis, Mo. Gives no reply to repeated requests for information. Location of property, if any, unknown.

ANI GROUP.**JAPAN.**

Owned and operated by Furukawa Copper Co.

MINA LAS ANIMAS.**MEXICO.**

Office: care of P. Sandoval y Ca., Nogales, Sonora, Mex. Mine office: Santa Ana, Sonora, Mex. Ores carry gold, silver, copper and lead. Main shaft 400'. Has steam power and 40-ton smelter, employing about 25 men at last accounts.

ANITA CONSOLIDATED COPPER CO.**ARIZONA.**

Reorganized, 1903, as Anita Copper Co.

ANITA COPPER CO.**ARIZONA.**

Office: 19 Congress St., Boston, Mass. Mine office: Williams, Coconino Co., Ariz. Organized, August, 1903, under laws of Arizona, with capitalization \$5,000,000, shares \$5. Employs 20 to 50 men. C. O. Brightman, president; Henry L. Nesmith, secretary; Paul Whitin Abbott, treasurer; John M. Cameron, superintendent. Beacon Trust Co., Boston, registrar. Lands, 50 claims, area 1,000 acres, surveyed for patents, lying on both sides of the Bright Angel branch of the Sante Fé railway, also 160-acre millsite and 60 acres miscellaneous lands, giving total area of 1,220 acres, all in the Francis mining district. Country rocks are carboniferous limestone, supposedly about 800' in thickness, showing irregular lenses carrying three known ore bodies, of which one is undergoing development, this giving oxide and carbonate ores assaying 8% to 15% copper and 3 to 4 oz. silver per ton, with a trace of gold, opened by shafts of 103', 93', 40', 35' and 580', and by several hundred feet of short tunnels. Mine has a 10x14" Fairbanks & Morse gasoline hoist, good for depth of 2,000', 12-drill Rand air compressor and 8 power drills. Smelter, at Williams, 47 miles from mine, with all-rail communication, has a 100-ton water-jacket blast furnace, with other necessary machinery for a 200-ton smelter. For 1905 company plans to develop by drifts and explore by diamond drills.

ANITA COPPER MINES CO., S. A.**MEXICO.**

Controlled by Douglas Copper Co.

ANITA MINING CO.**MEXICO.**

Office: 11 Wall St., New York. Letter returned from mine office: Bolaños, Jalisco, Mexico. Employs 40 men. Peter J. Quinn, president; R. W. Elliott, secretary; Thos. R. Warne, manager. Organized April, 1899, under laws of South Dakota, with capitalization \$500,000, shares \$1 par. Debentures; \$35,000 authorized, \$10,000 issued, at 6%. Mineral lands, 20 pertenencias, with 20-acre millsite and 20,000 acres of miscellaneous lands, in the Bolaños district. Has 3 shafts, deepest 360', also 3 tunnels, longest 600'. Property is an antigua, opened circa 1600, again worked 1849-1863, and reopened by present company in 1899. Has steam power, air-compressor, shops and smelter receiving ore by tram, 4,000' from the mine, having a 40-ton blast furnace and 20-ton reverberatory furnace, turning out blister copper said to carry 95% copper, 160 oz. silver and 6 oz. gold per ton, which is refined, when made at all, at the Guggenheim plant in Aguascalientes. Nearest railroad is the Mexican Central, 140 miles distant. Smelter idle and company has been experimenting with a new-fangled "reduction process," which the inventor firmly expected would turn raw ore into blister copper without fluxes, in one heat. Company said to contemplate installing a concentrating plant.

ANNA MINE.**ARIZONA.**

Mine office: Providence, Yavapai Co., Ariz. Supposed to be owned by Fairbanks, Morse & Co. Jas. Gillespie, superintendent, at last accounts. Has steam power and 15-stamp mill. Probably idle.

ANNANDALE MINE.**AUSTRALIA.**

Operated by Blayney Mining & Smelting Company.

ANNIE MINE.**WYOMING.**

Mine office: Jelm, Albany Co., Wyo. C. W. Brammel, superintendent.

ANTIETAM MINE.**ARIZONA.**

Mine office: Metcalf, Graham Co., Ariz. Paul F. Crowley, general manager. Lands, 3 claims opened by 146' shaft, with drifts showing ore body of 15' to 35' width, giving assays of 4% to 10% copper, 7 oz. silver and \$2 gold per ton, from chalcopryite and chalcocite. Has shipped considerable ore in a small way and is a property of much more than average promise, being developed without brag or bluster by practical miners.

COMPAÑIA DE COBRES DE ANTOFAGASTA.**CHILE.**

Office: Blanco No. 144, Valparaiso, Chile. Mine office: Chiquicamata, Antofagasta, Chile. Employs 100 men. Organized September, 1900, under laws of Chile, with capitalization £65,000, shares £10 par. Federico Lesser, chairman; Edouardo I. I. Sandiford, vice-chairman; Carlos R. Harrison, secretary; Alejandro Muirhead, general manager. Lands are 30 claims, area 100 hectares, also 2 kilometres of river frontage for water power. Property is served by a branch of the Bolivian Railway. Company is developing its more important properties and on reaching a depth of 140 metres with main shaft will crosscut 200 metres north and south, and drift same distance east and west on the vein. Company's holdings are situated in what is considered the most valuable portion of the Chiquicamata district.

AO MINE.**NEW CALEDONIA.**

Owned and operated by the Caledonia Copper Co., Ltd.

APACHE COPPER CO.**ARIZONA.**

Office: care of L. H. Wilson, fiscal agent, 52 Broadway, New York. Capitalization \$2,500,000. M. Zulick, president. Lands are in Yuma Co., Ariz., about 25 miles east of the Colorado river and 100 miles west of Congress Junction, Ariz. Property is developed by shafts and tunnels showing ore with good gold and silver values. Considerable ore has been mined and is on the dumps. Management is considered honest and property valuable, if given adequate transportation facilities, or smelter in the neighborhood.

APACHE MINE.**NEW MEXICO.**

Mine office: Spear, Grant Co., N. M. Robt. Anderson, superintendent.

APACHE & MULTNOMAH MINES.**WASHINGTON.**

Mine office: Nespelim, Wash. F. O. Hudnut, superintendent. Ores carry gold, silver, copper and lead.

APEX COPPER CO.**COLORADO.**

Office: 304 Colorado Bldg., Colorado Springs, Colo. Mine office: Hayman, Park Co., Colo. John K. Vanatta, president; J. J. O'Driscoll, vice-president and general manager; W. L. Boatright, secretary; Emil Erickson, superintendent. Organized March, 1903, under laws of Colorado, with capitalization \$1,000,000, shares \$1 par; unissued, \$146,000. Ended 1904 with \$4,300 cash on hand and without liabilities. Lands, 9 claims, area about 90 acres, in the Lower Tarryall district, showing two nearly vertical contact veins between spar and limestone of 3' average width, carrying chalcopryite and bornite assaying 14% to 30% copper, 7 oz. silver and \$1.20 gold per ton, opened by shafts of 210', 40' and 72', and by four tunnels of 10' to 90'. Has steam power, 7-drill Leyner air compressor and 3 power drills. Colorado Midland R. R. is $4\frac{1}{2}$ miles distant. Company plans sinking a new 4x10' working shaft to cut the vein at a depth of 250', using the old shaft for ventilation. Management is well regarded.

APEX MINING CO.**WASHINGTON.**

Office: 22 Sullivan Blk., Seattle, Wash. Mine office: Skykomish, Snohomish Co., Wash. Abner Griffin, president and general manager. Lands 10 claims, 6 miles from Berlin, opened by tunnel showing a fair sized ore body giving good assays in copper, gold and silver.

APOLLO CONSOLIDATED GOLD MINING CO.**WASHINGTON.**

Office: New Haven, Conn. Mine office: Republic, Ferry Co., Wash. E. J. Delbridge, general manager. Ores carry gold, silver, lead and copper. Has steam power and employed about 20 men at last accounts.

APOLLO COPPER MINING & SMELTING CO.**UTAH.**

Office and mine: Frisco, Beaver Co., Utah. Organized 1902, under laws of Utah, with capitalization \$40,000, shares 10c par. Geo. A. Gilbert, president; Matilda Olsen, secretary and treasurer. Probably idle.

NESTOR ARAIZA.**MEXICO.**

Office: Tepezalá, Aguascalientes, Mexico. Said to own and operate sundry small copper properties in that vicinity.

ARAKAWA MINE.

JAPAN.

Owned and operated by the Mitsu Bishi Gosshi Kwaisha.

ARAMO COPPER MINES, LTD.

SPAIN.

Offices; 2, Metal Exchange Bldgs., London, E. C., Eng. Mine office: Pola de Lena, Asturias, Spain. Organized, July 3, 1897, with capital, nominal, £40,000. C. W. Aston Key, secretary. Property is the Aramo copper and cobalt mines.

ARBUCKLE & SCHUMAN GROUP.

ARIZONA.

Office and mine: care of J. A. Stewart, superintendent, Clifton, Graham Co., Arizona. Lands adjoin the Shannon on the east. Five to ten men have been employed on development work during the two past years. Group has about a quarter mile of development work, showing some high-grade carbonate and sulphide ores.

ARCADIAN COPPER CO.

MICHIGAN.

Office: 24 West St., Boston, Mass. Mine office: Houghton, Houghton Co., Mich. Albert. C. Burrage, president; Chas. D. Burrage, secretary and treasurer; Nathan F. Leopold, general manager; Robt. H. Shields, agent. Organized March 31, 1899, under laws of New Jersey, with capitalization \$3,750,000, shares \$25 par. Lands, about 4,000 acres, including 6 old mines. Was extensively opened 1898-1901, and equipped with magnificent buildings and machinery, including a 3-stamp mill at Grosse Pointe. Operations proving unsatisfactory, all work was suspended early in 1903. Hoists, machinery and shaft houses were sold to the Trimountain, mill to the Centennial and dwellings to various purchasers. Property has been dismantled completely. Company supposed to have a large floating indebtedness.

ARCTIC CHIEF MINE.

YUKON.

Mine office: White Horse, Yukon, Canada. At close of 1904 was preparing to install an air compressor and power hoist. Said to have a good showing of ore.

ARDILLA COPPER MINES, LTD.

PORTUGAL.

Offices: 20-21, Lawrence Lane, London, E. C., Eng. Mine office: Barrancos, Alemtejo, Portugal. Maj. Henry Slane Fleming, chairman; A. L. Pulido, mine manager; Wm. Cooper, secretary. Capital, nominal, £120,000; issued, £108,080. Lands, 11 concessions, area 1,331 acres, on the Ardilla river. Company is out of funds, with rather poor prospects.

ARENILLAS COPPER MINES, LTD.

SPAIN.

Offices: 7, Laurence Pountney Hill, London, E. C., Eng. Registered Jan. 9, 1903, with authorized capital £255,000. S. S. McNicol, chairman; S. A. Hassan, secretary. Lands, 108 hectares, including the Nerva mines at Arenillas, Spain.

ARGHANA MADEN MINES.

TURKEY.

Office: care of Imperial Minister of Forests & Mines, Constantinople, Turkey. Mine office: Arghana Maden, Turkey. Property is owned and operated by the Turkish Crown. Ores average about 12% copper. Mine has been operated for nearly 300 years and is opened by adits. Ore is smelted in a primitive manner, with charcoal, which is scarce at the mine, and pro-

duct, amounting to about 2,500 metric tons annually, is shipped as a 50% to 60% matte, on camel-back to Tokat, or the coast. Production is hampered by lack of transportation facilities. Mine workmen are paid in food, clothing and tobacco.

ARGO COPPER MINING CO.

MONTANA.

Office: care of Canoll & Martin, Helena, Mont. Property is near Canyon Ferry, Lewis & Clarke Co., Mont. H. W. Canoll, superintendent. Has a small concentrator and ships concentrates of about 25% in copper tenor with gold values. Ore is high grade, with iron gangue.

**ARGO MINING, DRAINAGE, TRANSPORTATION
& TUNNEL CO.**

COLORADO.

Succeeded by Argo Tunnel & Mining Co., Ltd.

ARGO TUNNEL & MINING CO., LTD.

COLORADO.

Offices: 20, Great Winchester St., London, E. C., Eng. Mine office: Idaho Springs, Clear Creek Co., Colo. Capital, nominal, £350,000; £300,000 issued, fully paid. F. Hargreaves, chairman; Joseph C. E. Gillham, secretary; Lafayette Hanchett, superintendent. Is the second reorganization of the Newhouse Tunnel Co. Development is by a 13,138' tunnel. Ores carry gold, silver, lead and copper. Has steam and electric power.

ARGOLIS COPPER MINING SYNDICATE, LTD.

GREECE.

Registered March 1, 1904, with capital, nominal, £3,000, to acquire concessions from M. M. Fatrow and Anton Polo for 8,543,993 square metres in the Picada district of Epidaurus, near Nauplia, Greece.

ARGYLE MINING CO., LTD.

ARIZONA.

Offices: 194, St. Vincent St., Glasgow, Scotland. Mine office: Prescott, Yavapai Co., Ariz. A. Mitchell, secretary; Dr. Theodore B. Comstock, general manager; W. C. Bashford, local agent. Capital, nominal, £100,000; issued, £65,007. Lands, 2 claims, near Huron, Yavapai county, showing ore assaying well in copper, gold and silver.

ARIMEX CONSOLIDATED COPPER CO.

ARIZONA & MEXICO.

Office: 85 Ames Bldg., Boston, Mass. Organized under laws of New Jersey, with capitalization \$5,000,000, shares \$25 par. Chas. H. Dickey, president; C. D. Burrage, secretary. Property includes the Copper Prince group of 30 claims, in the Silver Bell district, Pima Co., Arizona, held through the Oxide Copper Co.; seven-eighths of the stock of the Table Mountain Copper Co., which has 27 claims in the Bunker Hill mining district of Pinal Co., Arizona, and nine-tenths of the stock issue of the Angang Copper Co., which holds about 400 pertenencias, known as the Chirangangueo mines, near Zitacuaro, Michoacan, Mexico. Neither of the Arizona properties is of apparent value, but the Mexican claims might be of some value if properly developed.

**ARIZONA & ARKANSAS LEAD, ZINC &
COPPER MINING CO.**

ARIZONA & ARKANSAS.

Office: 208 Tajo Bldg., Los Angeles, Cal. Mine office: Gila Bend, Maricopa Co., Ariz. B. E. Lower, president and general manager; Alex. C. Murphy, secretary; A. A. Kendrick, superintendent. Organized April, 1900, under

laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Lands 9 claims, in the Copper Zone Mountains, Eagle Tail district, 45 miles from Gila Bend, showing gold and copper ores. Also has lands in Baxter county, Arkansas, carrying lead, zinc and copper ores.

ARIZONA BLUE BELL COPPER CO.

ARIZONA.

Office: 71 Broadway, New York. Mine office: Mayer, Yavapai Co. Ariz. Organized under laws of Delaware, with capitalization \$500,000, shares \$1 par. C. A. Hamilton, president; M. L. Bouden, secretary and treasurer; Ernest A. Haggott, general manager. Lands, 3 claims, area 60 acres, also 320 acres miscellaneous lands, in the Big Bug district. Has 3 veins, fissures in Algonkian slates, with quartzite footwall and grano-diorite hanging, developed by 6 shafts, deepest 300', and tunnels of 70' and 75', giving assays of 5.85% copper, 2.35 oz. silver and 0.15 oz. gold per ton, from cuprite, malachite and chalcopyrite. Estimated by company to have 200,000 tons of ore blocked out, which probably is much too high, but is said to have a very large ore body on the 300' level.

ARIZONA CENTRAL COPPER CO.

ARIZONA.

Office: Prescott, Ariz. Mine office: Williams, Coconino Co., Ariz. J. F. Wilson, president; J. M. Elder, secretary; M. Salzman, superintendent.

ARIZONA-COLORADO COPPER BELT & GOLD

ARIZONA.

MINING & MILLING CO.

Office: 248 Equitable Bldg., Denver, Colo. Mine office: Globe, Gila Co., Ariz. Hon. R. L. Force, president and general manager; Frank A. Wright, vice-president; Jos. D. Whitham, secretary and treasurer; Dayton B. Whitham, superintendent and engineer. Organized September, 1901, under laws of Arizona, with capitalization \$2,500,000, shares \$1 par. Lands, 18 claims, area 370 acres, showing veins ranging from 3' to 100' in width, carrying auriferous and argentiferous oxide and carbonate ores of copper assaying 8% to 30% copper, 20% to 50% lead, 1 oz. to 200 oz. silver and \$3 to \$30 gold per ton. Has 7 pits and shafts, deepest 165', also several tunnels from 10' to 200' in length. Has 100-h. p. steam equipment. Work was resumed late in 1904, after some months idleness.

ARIZONA COMMERCIAL CO.

ARIZONA.

Succeeded, 1904; by Arizona Commercial Copper Co.

ARIZONA COMMERCIAL COPPER CO.

ARIZONA.

Office: 11 Pine St., New York, N. Y. Mine office: Globe, Gila Co., Ariz. Organized 1904, under laws of Maine, with capitalization \$2,500,000, shares \$25 par. Of the stock issue, \$1,000,000 was given the Arizona Commercial Co., for transfer of its property, \$1,000,000 was given the Metamora Company for its property, and \$500,000 was retained in the treasury for working capital. N. L. Amster, consulting engineer; W. S. Sultan, superintendent. Lands, sundry claims just north of the Old Dominion and adjoining the United Globe. Principal development is on the Copper Hill claim, which has a 620' shaft, showing oxide and carbonate ores near surface, with an 8' vein of medium grade chalcopyrite on the sixth, or bottom level. Mine has about 4,000' of openings, said to show 200,000 tons of ore blocked out, partly smelt-

ing ore but mainly of concentrating grade. Mine is connected underground with the Gray mine of the Old Dominion, for ventilation and safety. Property is considered promising and the new management, which is composed of able and experienced copper men, purposes pushing developments systematically.

ARIZONA CONSOLIDATED COPPER MINES, LTD. ARIZONA.

Offices: 80, Coleman St., London, E. C., Eng. W. W. Macalister, secretary. Organized June 17, 1899, with capital nominal, £150,000, shares £1 par. Lands, sundry claims in the Copper Mountain district of Graham county, Arizona.

ARIZONA CONSOLIDATED MINING CO. DELAWARE.

Office: 1420 Chestnut St., Philadelphia, Pa. Organized July, 1904, under laws of Delaware, with capitalization \$1,000,000, shares \$1 par, in \$300,000 preferred and \$700,000 common stock. Alfred S. Miller, president; James N. Stetson, secretary and treasurer. Lands include the Russell group in the Dragoon Mountains, Cochise Co., Arizona, formerly owned by the Russell United Copper Co. Development is by a 300' working shaft on the Mammoth and a 250' shaft on the Republic, disclosing large quantities of sulphide ore, several thousand tons of which have given smelter returns of 12% to 15% copper. Company plans erection of reduction plant or smelter during 1905, also construction of a 7-mile railroad from the mines to Cochise Station, on the Southern Pacific R. R. Company is in good financial condition, without debts, and has sold no stock publicly, working capital being provided by the management. Property is one of considerable promise, and possesses an energetic and honest management.

ARIZONA COPPER BUTTE MINING CO. ARIZONA.

Office: Minneapolis, Minn. Lands, if any, not located. Perhaps same company as the Copper Butte Mines.

ARIZONA COPPER CO., LTD. ARIZONA.

Offices: 29, St. Andrew Sq., Edinburgh, Scotland. Mine office: Clifton, Graham Co., Ariz. Employs about 2,000 men. Organized August 5, 1884, with capitalization £755,000, of which £736,504 is issued, in 160,000A 5s. preference shares, £316,530 fully paid preference shares, £316,530 fully paid preferred ordinary shares and £63,444 fully paid deferred shares. Profits are divided as follows: 10% cumulative dividends on A preference shares; cumulative 7% dividends on preference shares; 10% non-cumulative dividends on preferred ordinary shares; 10% non-cumulative dividends on deferred ordinary shares; balance, if any, to be divided pro rata between preferred ordinary and deferred ordinary shares. Debentures, £183,000 at 5%. Fiscal year ends Sept. 30th. Company pays large dividends, having paid 5s. 6d. Feb. 25, 1903, on preferred and common stock, an interim dividend of same amount July 24, 1903 and regular dividend of same amount on Sept. 30, 1903. In addition to paying large dividends the company has expended about £560,000 in reconstruction of plant, railways, etc., since 1901. About 20% of the stock issued is held in the United States. For the year ending March 31, 1904, the company earned profits of nearly £150,000, and a divi-

dend of £107,659 on ordinary shares was paid July, 1904. Sir Wm. John Menzies, W. S., chairman; Wm. Exley Miller, C. A., secretary; James Colquhoun, general superintendent; Alex. Veitch, general manager; Geo. Fraser, superintendent; Walter A. Moore, mill superintendent; A. T. Thompson, clerk.

Lands, about 4,000 acres, including eight producing mines at Morenci, Metcalf, Longfellow, Garfield and Coronado, all in Graham Co., Ariz. The ores average about 3.25% copper and production is about 10% smelting ore and 90% concentrating ore. The mines are developed to a depth of about 500' only and are opened mainly by tunnels, giving cheap extraction. Notwithstanding the comparative shallowness of the properties, a tremendous amount of ore is developed, the ore reserves being estimated by the company's engineer as giving 20 to 25 years supply in sight. This estimate is a conservative one.

The Humboldt mine, which is the largest producer, shows an enormous body of low-grade disseminated chalcocite. Extraction from this property is partly open-cast, but mainly through tunnels equipped with electric lights and electric traction. The haulage system uses the overhead trolley, power being furnished by a 146-h. p. Crossley gas engine driving a 100-h. p. generator that furnishes a 225-volt current. Electric locomotives of 10-h. p. haul 40-ton loads, the line having a single track laid with 35-lb. rails that runs 600' directly into the mountain, with a loop reaching all workings of the Humboldt mine.

The Longfellow mine is the oldest copper producer of Arizona, dating from circa 1877. Extensive developments are under way, these including a new tunnel driven in from Chase Creek, which will do away with the hoisting plant and permit cheaper extraction, while opening the mine to much greater depth than heretofore.

The Metcalf group, 7 miles from Clifton, is worked open-cast and is an extensive producer, product being mainly low-grade oxidized ores, which are concentrated with the sulphide ores from the Humboldt and Yavapai groups. The Coronado group, 9 miles from Clifton, has a new shaft down 400' and is producing considerable high-grade ore. The Clay is a small producer.

Ore is taken from the different mines by 6 gravity tram-lines to storage bins on the Coronado railroad, thence to the reduction plant, at Clifton. This was remodeled 1902, and further enlarged in 1904, and now includes five concentrators, smelter, acid plant and leaching plant. The concentrators have a combined daily capacity of about 1,200 tons, and are operated by gas and electric power. There is also a 300-ton concentrator at Longfellow, for which power is furnished by three 110-h. p. Crossley gas engines. The concentrator puts 6.6 tons of crude ore into one ton of concentrates, and Chase Creek has been dammed, to stop the tailings going into the Frisco and thence into the Gila river, which caused considerable damage to farmers and ranchers, and was a source of annoyance to all concerned. Concentrator and smelter are connected by a gravity tramway.

The smelter has a steel frame, slate roof and floor of iron plates laid in

cement, being well designed and thoroughly modern. There are six 300-ton water jacket furnaces, with blast supplied by No. 7 and No. 9 Root blowers operated by a 270-h. p. engine. Gases from the furnace pass through a 480' tunnel and a 300' shaft, discharging 300' above the level of the town. Matte of 50% to 55% is charged into the converters by a 10-ton ladle operated by a 30-ton electric crane. The conversion plant has 3 stands with six 7-ton shells, having a daily capacity of 50 tons of 99.5% blister copper. Disintegration of slag by running water was tried, but has been discontinued and molten slag again is handled in ladle cars, with a steam locomotive. The reduction plant went into commission in 1901, and is well designed and thoroughly modern throughout. The acid plant makes about 3,500 tons of sulphuric acid yearly from the fumes of the roasters, the entire product being used in the leaching plant, which treats an average of about 250 tons of low-grade oxidized ores daily. In connection with the lixiviation works there is a 125-ton bluestone plant, making about 3,000,000 lbs. of copper yearly. The Arizona has developed the most successful leaching plant in the United States, and its management is entitled to great credit therefor.

The mines and works use about 2,700 h. p., supplied almost equally from gas, steam and distillate engines. The company operates the Coronado railway, of standard gauge for 4 miles from Clifton to Longfellow and of 36" gauge 2.5 miles from Longfellow to Metcalf, also the Arizona & New Mexico railway, a standard gauge line running 107 miles from Clifton to Hachita, N. M., where connections are secured with the El Paso & Southwestern. Profits of these lines were £69,173 in 1903. The Coronado railway has 30-ton ore cars.

The miscellaneous enterprises of the company include a well equipped foundry and machine shop, sawmill, planing mill and 20-ton ice plant, in addition to the usual shops. Construction of all buildings is of brick. A good library and reading room are maintained for employees. Production was 29,200,552 lbs. refined copper in 1904, and should be about 35,000,000 lbs. in 1905. The property is one of great magnitude, and production can be largely increased by enlarging the already extensive plant. The company's management is excellent both as to finances, and the physical handling of the mines, mills and smelters. Production, 1904, was 32,197,760 lbs. fine copper.

ARIZONA COPPER & GOLD MINING CO.

ARIZONA.

Letter to company's address at Phoenix, Ariz., returned unclaimed.

ARIZONA COPPER HILL MINING CO.

ARIZONA.

Office: Jackson Bldg., Denver, Colo. Mine office: Tucson, Pima Co., Ariz. Organized 1900, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Edwin Scott, president; J. H. Edwards, secretary, Frank J. Buck, superintendent. Lands, 4 patented claims, area 65 acres, also 5-acre millsite and 160 acres miscellaneous lands, in the Cañada del Oro district near Oracle, Pinal county, Arizona, said to show a contact vein of 20' to 70' width and 4,817' length, giving estimated average values of 4% copper from carbonate and sulphide ores. Is opened by shafts of 281' and 350' and a 350' tunnel, with about 2,000' of underground openings, showing considerable ore. Has steam and gasoline power and 100-ton cyanide plant.

ARIZONA COPPER MINING CO.**ARIZONA.**

Mine office: Tucson, Pima Co., Ariz. B. C. Brechta, superintendent. Lands, 20 claims, opened by 400' tunnel, said to show an 8' vein carrying high grade ore. Company said to plan erection of a smelter.

ARIZONA COPPER MOUNTAIN MINING CO.**ARIZONA.**

Title changed, 1904, to Copper Butte Mines.

ARIZONA COPPER PLACER MINING & MILLING CO.**ARIZONA.**

Said to have operated near Quartzite, Yuma county, Arizona.

ARIZONA COPPER SYNDICATE.

Former office, 32 Broadway, New York. Organized under laws of West Virginia. Lands were forfeited, and afterwards bought back by leading shareholders and deeded back to company, subject to a \$7,000 mortgage, covering back taxes and cash advanced. An effort is being made to reorganize under title of Clifton Copper Mines, Ltd.

ARIZONA COPPER SYNDICATE, LTD.**ARIZONA.**

An English corporation. Moribund.

ARIZONA, EASTERN & MONTANA SMELTING & ORE PURCHASING CO.**MONTANA.**

Company apparently organized solely to sell stock. Dr. R. C. Flower, a notorious mining stock swindler, was a promoter.

ARIZONA GIANT COPPER CO.**ARIZONA.**

Office: 229 Byrne Bldg., Los Angeles, Cal. Mine office: Ehrenburg, Yuma Co., Ariz. R. M. Furlong, president; H. Franklyn Hiller, secretary and treasurer. Capitalization \$3,000,000, shares \$1 par. Lands 320 acres. Old management, which sold considerable stock at fancy prices, was ousted September, 1903. Former officers withheld books and present management wishes an accounting.

ARIZONA GOLD & COPPER CO.**ARIZONA.**

Office: 30 Broad St., New York. Mine office: Patagonia, Santa Cruz Co., Ariz. Organized February, 1900, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Debentures, \$32,500 first-mortgage 6% bonds, dated Feb. 1, 1902. Floyd B. Wilson, president; Frederick K. Jones, secretary; Col. Geo. W. Crowe, general manager; Harry L. Vaughn superintendent. Lands, 7 claims, area 140 acres, in the Tyndall district of the Santa Rita mountains, including the Gaelic, Trenton and Salero mines, opened by 7 shafts and a tunnel, latter showing a 4' vein said to average 3% copper, 15% to 20% lead and 10 oz. silver per ton. Has a 50-ton concentrator, built in 1903, and an 80-ton smelter at Patagonia.

ARIZONA GOLD & COPPER MINES CO.**ARIZONA.**

Office: 19 Park Row, New York. Mine office: Wickenburg, Maricopa Co., Ariz. Geo. A. Sanders, manager; A. A. Pratt, superintendent. Property is the Angel mine. Ores carry gold and copper. Has gasoline power.

ARIZONA GOLD & COPPER REDUCTION CO.

An enterprise floated by Theodore Stegner, of Kansas City, Mo., a notorious promoter of swindling mining companies.

ARIZONA GOLD MINING & MILLING CO.**ARIZONA.**

Letter returned from former mine office, Briggs, Yavapai Co., Arizona,

marked "out of business." Claims included the Swallow mine, showing auriferous copper ores and equipped with gasoline power and 10-stamp mill.

ARIZONA GOLD MINING CO.

ARIZONA.

Office: Chamber of Commerce Bldg., Portland, Ore. Mine office: Wickenburg, Maricopa Co., Ariz. O. H. Perry, president and general manager; W. T. Perry, secretary. Employs about 10 men. Ores carry gold and copper. Has gasoline power and plans building a small mill.

ARIZONA & HANCOCK MINING CO.

ARIZONA.

Office: Hancock, Mich. Mine office: Globe, Gila Co., Ariz. Organized 1901, under laws of Arizona, with capitalization \$250,000, shares \$1 par, as the Pinto Creek Copper Co. John D. Cuddihy, president; Alfred C. Sieboth, vice-president and manager; Henry L. Baer, secretary and treasurer. Lands, 19 claims, near Globe, opened by a 450' shaft and 400' crosscut, showing considerable bodies of 3% to 5% ore, main shaft showing stringers of rich ore on the 450' level, and expected to cut the Proctor lode at a depth of about 725'. Has steam power. Nearest railroad, 2 miles.

ARIZONA & HECLA DEVELOPMENT CO.

ARIZONA.

Proposed title of company organized later as Pittsburg & Hecla Development Co.

ARIZONA-MEXICAN COPPER CO.

MEXICO.

Office: Phoenix, Ariz. Mine office: Caborca, Sonora, Mex. Employs about 40 men. J. E. Hubinger, president; W. E. Defty, vice-president and consulting engineer; W. C. Foster, treasurer; C. T. Vincent, superintendent; J. C. Flores, mine foreman. Organized February 14, 1902, under laws of Arizona, with capitalization \$3,000,000, shares \$10 par; unissued, \$780,000. Lands, 79 pertenencias, known as La Gran Proveedora de Cobre, in the Altar district, 75 miles from the Sonora Railway. Country rock is granite, ores carrying an iron and spar gangue. Vein is 228' wide giving average assays of 6.7% copper, 12 oz. silver and \$2 gold per ton, and is opened by shafts of 102' and 200', and tunnels of 209' and 228'. Development work has been well planned and executed, every foot of opening being in the ore body. A winze from a 190' drift follows the footwall, entirely in ore, with druses of very rich carbonates. About 2,500' of underground openings have been secured, of which 2,300' are in ore. Extreme depth reached is 525'. Gangue of ores being spar and iron, an ideal self-fluxing ore results. From the 400' level down some ore bodies assayed 22% to 30% copper and as high as 131 oz. silver per ton. Results have been so satisfactory that the company, which practically is a close corporation, has decided to install a 100-ton smelter, which it is hoped to have in blast about the close of 1905. Management is good and property gives every indication of making a large and successful mine.

ARIZONA-MICHIGAN MINING CO.

ARIZONA.

A company by this name is said to be operating in the Bradshaw Mountains, about 14 miles south of Prescott, Yavapai Co., Ariz.

ARIZONA MINE.

WYOMING.

Mine office: Hecla, Laramie Co., Wyo. Horace E. Adams, owner. Has steam power, 5-stamp mill and leaching plant. Ores carry gold and copper.

ARIZONA MINING CO.

Office: 311 Pozzoni Bldg., St. Louis, Mo. Mine office: Pinos Altos, Grant Co., N. M. F. Townsend, superintendent. Ores carry gold, silver and copper. Has gasoline power and employed about 25 men at last accounts.

ARIZONA MINING & DEVELOPMENT CO.**MEXICO.**

Mine office: Naco, Sonora, Mexico. Lands, a group of claims about 8 miles south of Naco, formerly held by the Gold Treasure Mining Co.

ARIZONA-PACIFIC COPPER CO.**ARIZONA.**

Office: 702 Stevenson Bldg., Indianapolis, Ind. Mine office: Florence, Pinal Co., Ariz. Organized, March 30, 1903, under laws of Arizona, with capitalization \$5,000,000, shares \$1 par. F. P. Jeffries, president; John W. Sharpe, vice-president and general manager; Henry Severin, treasurer; Murat W. Hopkins, secretary; E. R. Stafford, superintendent. Lands, 16 claims, area 330 acres, also an 80-acre smelter site and 160 acres of possible oil lands. Property shows sundry minor veins, assaying 3% to 20% copper and \$5 to \$20 gold per ton. A quartz-porphyry dyke, 1,200' long and about 500' in extreme width, with axes east and west, is shattered in every direction, and cemented by veins carrying cuprite, melaconite and chalcocite, giving estimated average values of 3% copper, 1 oz. silver and \$2 gold per ton. Has shafts of 80' and 350', 600' apart, also tunnels of 280' and 342', at same distance. Has 2 gasoline hoists, air-compressor, power drills and necessary mine buildings. Officers of company are men of good standing and the property is regarded as promising, owing to great size of the ore body, though the ore is low in tenor, but well adapted to close and economical concentration. It is planned to install a small concentrator during 1905.

ARIZONA UNION CONSOLIDATED GOLD & COPPER**UTAH.****MINING CO.**

Supposed to have an office in Cincinnati, and supposed to have 54 claims about 150 miles from Fairfield, Utah, the nearest railroad point. Company's literature deals largely in glittering generalities.

ARIZONA UNITED COPPER CO.**ARIZONA.**

Office: 35 Wall St., New York. Edmund D. Willetts, president, at last accounts. Apparently moribund.

ARIZONA UNITED COPPER MINING CO.**ARIZONA.**

Letter returned unclaimed from former office, 1417 Chemical Bldg., St. Louis, Mo.

ARIZONA & WEST LAKE COPPER CO.**ARIZONA.**

Office: Bisbee, Ariz. Organized 1903, under laws of Arizona, with capitalization \$1,000,000. John M. Stanaway, president; J. J. McCarthy, superintendent. Lands, 18 claims, 3 miles northwest of Packard, Cochise county, Arizona. Had a 65' shaft early in 1904.

ARIZPE GOLD & COPPER CO.**MEXICO.**

Had lands in the Arizpe district of Sonora, Mexico. Company dead, with enough charges of fraud to justify a post mortem.

ARLINGTON MINE.**WASHINGTON.**

Letter returned unclaimed from Conconully, Okanogan Co., Wash.

H. S. Stoolfire, owner. Ores carry gold, silver and copper. Has steam power.

ARLINGTON COPPER CO.

NEW JERSEY.

Lands at Arlington, N. J., sold Sept. 30, 1903, for debt.

SUCESION FRANCISCO ARMANDAIZ.

MEXICO.

Office: Apartado Postal 37, Monterey, N. L., Mex. Mine office: Cerralvo, Nuevo León, Mex. Ores carry silver, lead and copper. Employs 50 to 60 men.

ARMINIUS CHEMICAL CO.

VIRGINIA.

Office: 56 Wall St., New York. Mine office: Mineral City, Louisa Co., Va. Rowland F. Hill, president; W. Maw, secretary; Alvin P. Maw, general manager. Mines cupriferous pyrites. Has steam power, and concentrator.

SOCIEDAD MINERA LA ARMISTAD.

SPAIN.

Office: San Antonio, 44, Granada, Spain. Mine office: Albeñuelas, Granada, Spain. Don Joaquin Marin Robles, president. Property is the Santa Ines mine, carrying copper and cobalt ores.

ARMSTRONG MINE.

CALIFORNIA.

Office: care of W. Roy, Merced, Cal. Property is a prospect in Indian Gulch, Mariposa county, California.

ARNOLD MINE.

MONTANA.

Office: care of Dr. G. E. Blackburn, owner, Butte, Mont. Mine office: Elliston, Powell Co., Mont. Made some shipments of carbonate copper ore to smelter at Tacoma, Washington, late in 1904.

ARNOLD MINING CO.

MICHIGAN.

Office: 50 State St., Boston, Mass. C. Howard Weston, president; John Brooks, secretary and treasurer; Wesley Clark, superintendent. Organized under laws of Michigan, with capitalization \$2,500,000, shares \$25 par; issued, \$1,550,000. Has about 50 cents per share cash in treasury. Annual meeting, second Tuesday in May. Lands 3,323 acres, in Town 58 North, Range 31 West, and Town 58 North, Range 30 West, Keweenaw county, Michigan. Lands are in two tracts, comprising the old Copper Falls mine and the Arnold mine proper, with frontage of about 3 miles on Lake Superior. Property lies north of the greenstone. Copper Falls mine worked, circa 1850 until August 1893, making 12,843 tons, 429 pounds fine copper, and paying dividends of \$100,000. Product was secured mainly from the Owl Creek fissure vein. Arnold mine proper is developed on the Arnold ashbed; opened 1863, reopened 1897, closed 1901. Rock stamped averaged under 0.5% copper. Has a stamp mill and 2½ mile narrow gauge railroad, known as Arnold & Eagle Harbor, rolling stock of which has been sold. No. 1 shaft of the Arnold is about 1,000' deep, sunk at angle of 26° with the horizon. Recent developments at the Miskwabik property to the south, hold out encouragement that the Arnold may carry the northern extension of the Kearsarge lode.

ARPS CLAIMS.

CALIFORNIA.

Fifteen claims, in Town 34 North, Range 3 West, Shasta county, California. Have 4 tunnels, aggregating 1,600', with fair showing of sulphide

ore. Letters addressed to putative owners returned unclaimed from Redding, Cal.

ARRINO PROPRIETARY COPPER MINING CO. WEST AUSTRALIA.

Office: 17 Queen St., Melbourne, Australia. David Blair, manager. Property is in Western Australia, lands showing sandstone beds of Permian age, ore occurring as bunches and thin veins following the joints and fissures of the sandstone. Ores are mainly oxides and carbonates, with a little sulphide ore recently exposed. Sandstone formation, occupying a basin with gneiss walls, is about 300' wide by one mile long. Bulk parcels of ores shipped have given returns of 3.75% to 25%. Property has rail connections but process best adapted to treating ores of such unusual nature and occurrence has not been decided upon as yet.

ARTOLA HERMANOS.

CHILE.

Mine office: Cobija, Tocopilla, Chile. Operate the Gatico mine, opened 1891. Product, shipped as matte, is equivalent to an annual output of 1,000 to 2,000 tons of refined copper.

ERZBERGWERKE ASBECK BRÜGGEN UND BRÜGER-ROBERT.

GERMANY.

Mine office: Rönsahl, Westfalen, Germany. Apparently idle.

ASCOT MINE.

QUEBEC.

Mine office: Capelton, Sherbrooke Co., Que. Is a prospect undergoing development.

ASHBED MINING CO.

MICHIGAN.

Office: 50 State St., Boston, Mass. Organized 1880, under laws of Michigan, with capitalization \$1,000,000. John Brooks, secretary; Wesley Clark, superintendent. Lands, 1,143 acres, in vicinity of Copper Falls, Keweenaw county, Michigan. Property idle. Fully described in Vol. II.

ASHIO MINE.

JAPAN.

Owned and operated by Furukawa Copper Co.

ASHLAND MINING CO.

COLORADO.

Mine office: Ohio, Gunnison Co., Colo. Carroll M. Carter, superintendent. Property is the Carter group, carrying gold, silver, lead, copper and zinc ores. Has steam power and employed about 20 men, at last accounts.

COMPANIA MINERA DE ASIENTOS.

MEXICO.

Mine office: Asientos, Aguascalientes, Mex. Harry Rab, superintendent. Lands include the Nopensada mine, producing copper and silver. Main shaft 200'. Has steam and electric power and operates on a considerable scale.

SOCIETE CIVILE DES MINES DE CUIVRE D'ASPEICH.

FRANCE.

Offices: 3, Rue de Milan, Paris, France. G. Caton, manager. Lands are in the Basses Pyrenees, France. Idle.

ASTOR MINING CO.

COLORADO.

Mine office: Eureka, San Juan Co., Colo. E. C. Condit, superintendent. Property includes the Surprise, Mogul and other claims, carrying gold, silver, lead and copper. Has steam, water and electric power, and employs about 25 men.

SOCIEDAD INDUSTRIAL ASTURIANA.**SPAIN.**

Office: Oviedo, Spain. Mine office, Torres, Teruel, Spain. Lands, a group of slightly developed claims, near Torres.

SOCIEDAD INDUSTRIAL DE ATACAMA.**CHILE.**

Office and works: Tierra Amarilla, Copiapó, Atacama, Chile. Mines include the Lautaro, at Almolanos, in the San Antonio district of Copiapó, and other properties, and the company also has an idle smelter at Caldera. In 1903 the smelter at Tierra Amarilla treated 17,526 metric tons of ore, giving average returns of 11% copper, with considerable gold values, product being shipped as a rich auriferous copper-matte.

ATACAMA MINERAL CO., LTD.**CHILE.**

Voluntarily liquidated.

ATE MINE.**JAPAN.**

Mine office: Komatsu, Kaga, Japan. Works two main veins, in liparite and brecciated tufa, one being a fissure and one a contact vein. These veins cross, the intersection giving the richest ore. At a little distance from the point of intersection veins thin out and become of poor quality. Ore is chalcopyrite, with iron pyrites, showing bornite and tenorite in the upper portions, averaging about 10% copper. Production for 1900 was 231,484 lbs.

ATHELSTAN GOLD MINING CO., LTD.**BRITISH COLUMBIA.**

Absorbed, 1904, by Montreal & Boston Consolidated Mining & Smelting Co.

ATHELSTON & JACKPOT MINING CO.**BRITISH COLUMBIA.**

Absorbed, 1904, by Montreal & Boston Consolidated Mining & Smelting Co.

ATLANTIC MINING COMPANY.**MICHIGAN.**

Office: 15 William St., New York. Mine office: Atlantic Mine, Houghton Co., Mich. Employs about 700 men. Organized December, 1872, under laws of Michigan; reincorporated 1901, for term of 30 years, and capitalization increased 1902 to \$2,500,000, shares \$25 par, \$9.80 paid in. Annual meeting, second Tuesday in March. American Loan & Trust Co., Boston Transfer agent, Boston Safe Deposit & Trust Co., registrar. Jos. E. Gay, president; John Stanton, secretary and treasurer; preceding officers, John R. Stanton, Wm. C. Stuart, J. Wheeler Hardley, Wm. A. Paine and Samuel L. Smith directors; Frank McM. Stanton, agent; Theodore Dengler superintendent; F. G. Coggin, mill superintendent; John Stratton, mining captain; A. D. Edwards, clerk; John Grigg, master mechanic.

Official returns to the state of Michigan, as of date Jan. 1, 1904, disclose the following figures:

Amount of cash paid in on capital stock.....	\$280,000 00
Amount paid in by conveyance of property to company....	700,000 00
Entire amount invested in real estate.....	20,349.66
Amount of personal estate.....	344,911.53
Floating debt.....	100,468.33

Comparative figures for four years are as follows:

	1900.	1901.	1902.	1903.
Mineral produced, lbs..	6,577,955	6,317,645	6,847,270	7,670,660
Refined copper, lbs....	4,930,149	4,666,889	4,949,366	5,505,598
Total income.....	\$ 800,177	\$ 735,577	\$ 588,200	\$ 722,386
Expenses at mine	555,254	573,341	535,956	517,384
Smelting and transp'n	60,311	62,954	62,954	64,567
Interest .....	.....	.....	.....	4,199
Total cost	615,556	636,296	598,910	586,151
Mining profits	193,621	99,281	.....	136,234
Land sales .....	.....	11,600	47,788	25,000
Construction	114,007	191,143	38,676	10,893
Balance.....	+79,613	-80,262	-1,598	+150,341
Dividends	80,000	.....	.....	.....
Surplus	175,962	95,699	94,101	244,443

A dividend of 50 cents per share, amounting to \$50,000, will be paid Feb., 15, 1905. Last previous dividend was \$1 per share, amounting to \$40,000, in 1901.

The Atlantic mine lies about 2 miles south of Portage Lake and 4 miles southwest of Houghton, the 640-acre main tract including the mines known as the South Pewabic and Adams before 1872. The Atlantic has the Pacific on the north; Isle Royale and undeveloped lands on the east and south, and the Pacific and St. Mary's Mineral Land Co. on the west. The Atlantic lands are all on the mineral belt, being the south half of Section 4, except the southeast quarter of the southeast quarter; the north half of Section 9, and the northwest quarter of the northwest quarter of Section 10, all in Town 54 North, Range 34 West. The company also owns all of Section 16, same town and range, bought in 1897, on which crosscuts have been sent east and west, in search of the Baltic amygdaloid, without success, work having been discontinued August, 1903. The company also owns several thousand acres of timber lands, a millsite on Lake Superior and valuable frontage on Portage Lake.

The mine is opened on an amygdaloid bed of brownish, mottled color, averaging about 15' width, with strike of N. 50° E., and dip of 54° to 55° to the northwest. The lode is the most westerly worked in Houghton county, and is known locally as an ashbed, greatly resembling the ashbed of the Arnold and adjacent mines, and being in line with the probable southwesterly continuation of the Keweenaw county ashbed. The Atlantic ashbed carries the least copper of any lode now worked successfully, and long has been famous for its profits, wrung from rock yielding much less than 1% ingot copper. The low percentage of copper carried by the lode is a decidedly adverse factor, but the mine, under its present management, has met and survived many discouragements, including lean rock, mine fires, costly equipment necessitated by deepening shafts, installation of new machinery, the construction of a new mill, and the building of a private railroad required for the traffic of the mine. Among other disadvantages are a wet mine,

causing heavy pumping charges, and a treacherous hanging wall, necessitating the heaviest timbering used in any amygdaloid mine of the Lake Superior district. To offset all this are certain marked advantages, the ashbed being the softest rock mined in the district, requiring less power in drilling, less dynamite in breaking, and less steam in stamping, than any other lode, and breaking well, while everything is mined from wall to wall. The best of the lode is so low in copper that no assorting is attempted. The property has an able and economical management, and is often quoted by mining men and the technical press as the finest example extant of a successful low-grade mine.

There are 6 shafts, lettered in order from north to south. "A" shaft, the northernmost, opened in 1897 to develop newly purchased ground, was sunk at an angle of 54°, one degree flatter than the other shafts, and is the largest in dimensions of any, being 9x20' inside of timbers, with three compartments, two of which are skipways, the third for men and pipes. Surface improvements, completed in 1899, consist of a wooden shaft-rockhouse, 35x67' on the ground and 84' high, with four rock-crushers. There is a 38x50' boiler-house with redstone walls and steel truss roof, and a 48x50' engine-house of the same construction, containing a 26x48" double Corliss engine of Allis-Chalmers make with double conical drum of 10' diameter² at either end and 15' 6" in the center, raising 9-ton skips. The shaft proved lean, especially in the north drifts and careful mill tests proving this the poorest part of the mine, "A" shaft was abandoned in 1904.

"B" shaft is 1,377' southwest of "A" with 2 compartments, both having skip-tracks. This shaft was 2,200' deep at the close of 1904, showing good copper ground. "B" shaft has a fine surface plant, with double conical drum Corliss hoist of Allis-Chalmers make, similar in design to the plant at "A" shaft, but much larger throughout, the drum being 12' at each end and 24' 4" in diameter at the middle, where there is a cylindrical section 18" wide, thence tapering sharply in both directions. The drum has a 22' face and weighs 140 tons, all grooves being lathe-turned for 1 1/4" steel cable. The hoist is operated in counterbalance and is good for a depth of 4,000', 11-ton skips being raised at a speed of 3,400' per minute. The hoist operates at a steam pressure of 100 pounds to the inch, and is direct-acting and non-condensing, with band brakes at either end, set by gravity and instantaneously released by steam power. "C" shaft, next southwest was abandoned after the fire of 1898.

"D" shaft, 1,465' southwest of "B", 3,000' in depth, the deepest and best shaft of the mine, is 9x18' in size inside of timbers, with three compartments, two for skips worked in balance. The engine-house is 48x60' of redstone with steel truss roof, housing a Nordberg hoist working in balance and calculated to hoist six-ton skips from one mile depth. The boiler-house has four 150-h. p. Stirling boilers. This shaft is looking well and gives promise of good rock for the future, as it commands a large territory, and the bottom levels are the richest, and furnish the bulk of the Atlantic's production. "E" shaft, 2,440' deep is used for a man-way and pipes only. "F" shaft,

478' southwest of "D" was long a large producer and was 2,146' deep when put out of commission in 1902.

The lower levels of the mine apparently are growing richer. It is planned to make an important change in the system of mining by sinking the two operating shafts to the boundary lines, then begin extracting the rock from the bottom levels and working up. This method will permit the abandonment of all old drifts as soon as stoped, saving greatly in timbering costs. Air-blasts are causing some uneasiness.

The mine's equipment includes a 50-drill Ingersoll-Sergeant air compressor, machine, carpenter and blacksmith shops, and a sawmill. The principal buildings have fire pumps, and there is an efficient volunteer fire brigade. The village dependent on the mine has about 500 dwellings, half owned by the company, with several churches and one of the best graded schools in the state. The management always has taken a personal interest in the moral and material welfare of its employes, and is rewarded by the confidence and friendship of its workmen, regardless of nationality or creed.

The Atlantic railroad, owned by the company, connects mine and mill with 9 miles of main line, and a 3-mile branch line runs from the mine to the old millsite on Portage Lake, where there are large coal and merchandise wharves for receipt of fuel and supplies. The railroad has 4 Baldwin and 1 Brooks locomotives, 130 hopper-cars for rock and coal, and 60 flat-cars for wood and general freight. The mine is on the main line of the Copper Range railroad also.

The stampmill, built 1894-95, is at Redridge, on Lake Superior, having nearly two miles of water frontage, and is 151x234' in size, of wood on stone foundations. Water is furnished from a dam, described in the article on Baltic. The mill has 6 stamps with 18" cylinders, of about 400 tons daily capacity each. Chilean regrinding mills are used for the raggings, and round tables have been displaced by Overstroms, which effect an additional saving of very fine copper estimated at \$15,000 yearly value. Power is supplied by a 14x42" Reynolds engine of Corliss pattern. There are 7x14x12" Gardner fire pumps in the mill and boiler-house adjoining. A machine shop in the mill is supplied with all tools required for repair work and fitting. Adjoining the mill is the boiler-house, of wood, on stone walls, 71x101' in size. A Green fuel economizer, added in 1899, saves about 12% in coal bills. At the millsite there is a 30x36' frame warehouse, store building, smithy, and a number of comfortable dwellings for employes. The mill, like the mine, is very efficiently handled.

Production of refined copper showed a decrease in 1904, due to a trammers' strike in June and July. The explorations on Section 16 proved most discouraging, but recent developments on adjoining properties are of a decidedly different tenor. The sixth and seventh levels north of Baltic shaft No. 5, next south, are but little more than a quarter mile from the Section 16 line, and are showing much better ground than found above. The Superior Copper Co. has a promising showing on Section 15, and the new Isle Royale shaft on Section 11 is exceptionally rich, all of which point strongly toward the

existence of great mineral values under Section 16. No plans have been made for the resumption of explorations on 16, it being felt that nothing will be lost by allowing the three neighbors to prove their ground by further developments. The prospects of the Atlantic never have been brighter than at the close of 1904. Production, 1904, was 5,321,859 lbs. fine copper.

ATLANTIC & PACIFIC GROUP.

WYOMING.

Mine office: Encampment, Carbon Co., Wyo. Has a 150' shaft showing a 4' vein of fair grade ore about 1,000' from the line of the Ferris-Hoggarty mine of the Penn-Wyoming company.

ATLAS COPPER SYNDICATE, LTD.

Offices: St. James Sq., Manchester, England. Location of property, if any, unknown.

ATLAS EXPLORATION & MINING CO.

ARIZONA & MEXICO.

Office: Douglas, Ariz. Organized June 14, 1902, under laws of Arizona, with capitalization \$5,000,000, shares \$1 par; issued, \$500,000. Annual meeting, first Tuesday in January. R. O. Johnson, president; N. W. Chase, treasurer; D. T. Dunlap, secretary; James Ray, superintendent. Has undeveloped mineral lands, known as the Atlas group, in the Warren district of Cochise county, Arizona, and a rather promising prospect about 15 miles south of Douglas, in the northern part of the Arizpe district of Sonora, Mexico, latter showing auriferous copper ore. Idle at last accounts.

AKTIEBOLAGET ATVIDABERGS KOPPARVERK.

SWEDEN.

Office and mine: Atvidaberg, Ostergothland, Sweden. Organized 1900, under laws of Sweden, with capitalization 900,000 kroner, fully paid, shares 1,000 kroner par. Baron Th. Adelsward, president and general manager; Axel Nygren, superintendent; C. A. Rudelius, smelter superintendent. Ore is slightly argentiferous chalcopyrite, averaging 2% copper. Has 8 shafts, of 300' to 1,400', with about 4,000' of underground openings. Water power generates electricity that operates the mines and works. Has a smelter, at Bersbo, 9 kilometers from mine, with railroad connecting. Has a concentrator and smelter with 3 roasting furnaces, 3 reverberatory furnaces and settling tanks for cementation. Production in 1901 was 158,000 kgs. of cement copper; 60,959 kgs. of refined copper, and 186 kgs. of silver. A new shaft has been sunk recently in promising ground, and production has increased during past two years.

GEWERKSCHAFT AUGUSTE I.

GERMANY.

Mine office: Herscheid bei Barenstein, Westfalen, Germany. Has 1 shaft, showing lead and copper ores.

KUPPERERZBERGWERK AURORA.

GERMANY.

Mine office: Huckleheim, Bavaria, Germany. Apparently idle.

AURORA MINING CO.

MEXICO.

Letter returned unclaimed from La Cananea, Sonora, Mexico. Said to have done a little prospecting on lands near the Greene Consolidated.

AUSTRALIAN COPPER SYNDICATE, LTD.

Offices: 2, Royal Exchange Ave., London, E. C., Eng. Formed "to acquire mines anywhere in the world." Location of property, if any, unknown.

AUSTRALIAN MINING CO., LTD.

AUSTRALIA.

Offices: 42, New Broad St., London, E. C., Eng. W. J. C. Cutbill, chairman; Sir. Samuel Davenport, K. C. M. G., Burnside, Adelaide, South Australia, colonial agent; Edgar Collier, secretary. Capital £40,000, shares £2 par. Is a reorganization of the Australian Mining Co., which paid considerable dividends. Present company is paying annual dividends of 1s. per share. Lands, about 20,000 acres, in the Reidy Creek district, including the Tungkillio mine, leased to the Kitticoola Copper-Gold Co.

AVENTURERA MINE.

MEXICO.

Mine office: Sabinal, Chihuahua, Mex. Britton Davis, general manager. Ore bodies occur irregularly in slate dikes, and carry silver, lead and copper. Mine is opened by shafts, equipped with steam power and employed about 100 men at last accounts.

AVINO MINES OF MEXICO, LTD.

MEXICO.

Offices: 138, Salisbury House, London Wall, London, E. C., Eng. Mine office: Avino, Gabriel, Durango, Mex. Capital, nominal, £1,000,000; issued, £978,442; debentures, £18,800. Was reorganized, Feb. 24, 1903, shareholders being assessed 2s. 6d. and stock marked 17s. 6d. paid, the assessment paying a floating debt of about £50,000 and leaving about £70,000 for development and equipment. About 50,000 shares are owned in the United States. F. L. Gardner, chairman; F. F. Fuller, secretary; W. B. Jeffrey, general manager; W. A. Jeffrey, assistant manager; W. J. A. Palmer, mine manager. Lands, 252 acres, also a 302-acre damsite, 10 miles from a railroad, carrying a very large body of low-grade silicious silver-copper ores and said to have 2,000,000 tons of ore in sight. Is said to have produced about \$60,000,000, mainly in silver, in the past. Values are mainly silver and copper, with a little lead, highest grade ore being shipped to smelter. Has a 650' shaft showing oxides and a little native copper in the lower levels, also a 600' tunnel. Has steam and electric power. A large concentrator built on the property was found unsuited to the ore, and under the advice of Prof. Ottakar Hoffman was abandoned and replaced by a hyposulphite lixiviation plant of 100 tons daily capacity, which is said to be saving 85% of the silver and 30% of the gold values. Property employs 800 men. Former management spent too much money on surface and not enough in the mine, and also made a mistake in the plant devised for treatment. This is a very large, low-grade property, requiring skillful and cautious handling, but with good management should make a highly profitable mine, owing to the great extent of its ore bodies. At last accounts the mine was said to be producing about \$30,000 per month, Mexican, which paid operating expenses. Production, 1903, was 221,403 lbs. fine copper.

AZTEC MINE.

NEW MEXICO.

Mine office: Mineral Hill, Grant Co., N. M.

AZTEC COPPER CO.

ARIZONA.

Office: 136 Hartford Bldg., Chicago, Ills. Mine office: Prescott, Yavapai Co., Ariz. E. M. Sanford, attorney; S. J. Goldie, superintendent. Lands, 20 claims, showing copper ores. Has steam power,

AZTEC COPPER CO.**MICHIGAN.**

Office: care of John C. Watson, treasurer, 68 Devonshire, St., Boston, Mass. Lands, 1,534 acres, just east of the Hilton mine of the Adventure Consolidated, in Ontonagon county, Michigan. Has produced 353 tons, 863 lbs. of refined copper, of which 100 tons was secured in a single mass. Idle many years.

AZTEC COPPER MINING & SMELTING CO.**MEXICO.**

Office: 907 Stephen Girard Bldg., Philadelphia, Pa. Mine office: Rancho del Almiraz, Jalisco, Mex. Capitalization \$300,000. Dr. Pemberton Dudley, president; John R. Williams, treasurer; C. D. Lance, secretary. Company apparently is more deeply interested in peddling its stock than in developing a mine.

AZTEC GOLD & COPPER MINING CO.**COLORADO.**

Office: 18 Tremont St., Boston, Mass. Mine office: Needleton, La Plata Co., Colo. Organized 1899, under laws of Maine, with capitalization \$2,000,000, shares \$1 par. David W. Williams, president; Geo. F. Bradstreet, secretary and treasurer; W. Z. Kinney, general manager; Josiah Moore, superintendent. Lands, 40 claims, area 500 acres, showing 2 fissure veins averaging 2' width and carrying sulphide ores with estimated average value of \$18 per ton in gold, silver, lead and copper, developed by a 960' tunnel. Has gasoline, water and electric power.

AZURITE COPPER CO.**ARIZONA.**

Office: Williams, Ariz. Mine office: Willaha, Coconino Co., Ariz. Organized under laws of Arizona, with capitalization \$1,500,000, shares \$1 par. A. Tyroler, president; Olaf H. Prysz, secretary; John S. Green, superintendent. Lands, 10 claims in the Francis district, on the line of the Santa Fé & Grand Canyon R. R., showing promising ore bodies.

AZURITE COPPER & GOLD CO.**ARIZONA.**

Office: Tucson, Ariz. Mine office: Azurite, Pima Co., Ariz. Thos. Hughes, superintendent. Has auriferous and argentiferous copper ores, with steam power and 70-ton smelter. Lands, 13 claims, showing a large body of low-grade ore. Sold to Mineral Hill Cons. Copper Co.

BABCOCK & KITTERMAN GROUP.**OREGON.**

At Althouse, Josephine Co., Ore. A prospect on which limited development work has shown ore giving good assay values.

BABY MCKEE GOLD MINING CO.**OREGON.**

Mine office: Sumpter, Baker Co., Ore. L. G. Lilley, manager. Ores carry gold, silver, lead and copper. Has steam power.

BACHELOR GOLD MINING CO.**COLORADO.**

Mine office: Lake City, Hinsdale Co., Colo. C. F. Meek, superintendent. Ores carry gold, silver, lead and copper. Has water power and employed about 20 men at last accounts.

BADEN-BADEN GOLD MINING CO.**COLORADO.**

Office: 324 Cooper Bldg., Denver, Colo. Mine office: Black Hawk, Gilpin Co., Colo. Newell Bros., managers. Has gold-silver-copper ores and steam power.

BADGER COPPER CO.**WYOMING.**

Letter returned unclaimed from Laramie, Wyoming. Organized 1902 to operate in Albany county, Wyoming.

BADGER MINE.**COLORADO.**

On the Platte river, 12 miles east of Pearl, Larimer county, Colo. Owned by Alex. Hilton, et al. Has a limited amount of development work, making a fair showing of high-grade ores.

BADGER STATE MINING & MILLING CO.**WYOMING.**

Office and mine: Saratoga, Carbon Co., Wyo. Gustave Jensen, president and general manager; John H. Davis, vice-president and superintendent; C. E. Jensen, treasurer; A. H. McDougal, secretary. Organized December 26, 1901, under laws of Wyoming, with capitalization \$1,000,000, shares \$1 par. Lands, 8 claims, area 140 acres, showing 3 fissure veins, averaging 4' width, and giving average assays of 50% copper, 50% lead and from a trace up to 400 oz. silver per ton, opened by shafts of 60' and 105' and a 90' tunnel.

BAGDAD GOLD & COPPER CO.**CALIFORNIA.**

Office: care of Myron H. Wells & Co., 388 Wilcox Bldg., Los Angeles, Cal. Mine office: presumably Bagdad, San Bernardino Co., Cal. Sherman Washburn, president; V. L. Carroll, secretary.

BAHIA EXPLORATION CO.**BRAZIL.**

Has sundry claims about 50 miles west of Jaguarary, Brazil, showing ores assaying 2% to 4% copper.

BALACLAVA COPPER MINING CO.**AUSTRALIA.**

Mine office: Broken Hill, N. S. W., Australia. W. O. H. Simons, superintendent. Has auriferous copper ores and employs about 20 men.

BALADE MINE.**NEW CALEDONIA.**

Address: probably Noumea, New Caledonia. Mine discovered 1884. Ores are concentrated up to 17 to 20% copper. Production trivial.

BALAKLALA CONSOLIDATED COPPER CO.**CALIFORNIA.**

Office: Mills Bldg., San Francisco, Cal. Mine office: Kennett, Shasta Co., Cal. Peter L. Kimberly, president; C. A. Malm, vice-president and treasurer; C. O. Ellingwood, secretary; W. F. Snyder, general manager; Grant Snyder, superintendent. Employs about 40 men. Company succeeded the Balaklala Mining Co. Lands, 64 claims, adjoining the Trinity mine, formerly under bond to the Mountain Copper Co., but not taken because of a defective title since remedied by the courts. Principal development is on El Capitan group, opened by tunnels showing a sulphide ore body 60' to 100' wide on the 400' level, ore ranging from very poor to very good, and claimed to show an average of better than 11% copper, which probably is about double the actual average. Property has been extensively probed by diamond drills, which have shown several large deposits about 100' below the body opened by tunnel. Ore occurs in lenses, the largest being estimated at 50x500x700' in size. Has steam and electric power, with line surveyed for railroad to connect the mine and smelter-site. Company plans building a smelter.

BALD MOUNTAIN MINING CO.**WASHINGTON.**

Has claims near Clear Lake, Skagit county, Washington. A. H. Rogers, superintendent, at last accounts. Probably idle.

BALHANNAH MINE.**AUSTRALIA.**

An idle mine at Onkaparinga, South Australia, 14 miles southeast of Adelaide. Ores carry copper, zinc, lead, silver, gold and bismuth. Idle for many years.

BALHANNAH COPPER & GOLD MINE, LTD.**AUSTRALIA.**

* Letter returned unclaimed from former address, Broad Street House, London, E. C., Eng.

BALKAN COPPER CORPORATION, LTD.***TURKEY.**

Offices: 6, Redcross St., London, E. C., Eng. Sir Owen R. Slacke, chairman; Ernest A. Foster, secretary; Mario Krieger, managing director in Turkey. Organized Sept. 5, 1899, with capitalization £250,000, shares £1 par; issued, £220,000. Property is the Yardimli copper mine, area 7,900 acres, and the Chapzi-Hane mine, area 2,500 acres, in the Rhodope Mountains, northwest of Constantinople, held on an annual rental of £420 and 5% royalty on gross earnings.

BALLA BAELA COPPER MINES, LTD.**AUSTRALIA.**

Reorganized as New Balla Balla Copper Mines, Ltd.

BALLARAT COPPER MINING CO.**WASHINGTON.**

Mine office: Newport, Stevens Co., Wash. Ores carrying gold, copper and silver, have been opened by a crosscut tunnel. Probably idle.

BALLARAT & LYELL MINES, LTD.**TASMANIA.**

Offices: 24, Blomfield House, London Wall, London, E. C., Eng. Herbert Allen, chairman; W. V. Ward, secretary. Is a reorganization of the Great Mount Lyell Copper Co., Ltd. Capital, nominal, £250,000. Lands, 639 acres, held on 21-year lease from 1898, at £170 annual rental. Has about 3,000' of underground openings, with narrow veins found at two points.

BALTIC MINING CO.**MICHIGAN.**

Office: 15 William St., New York. Mine office: Baltic, Houghton Co. Mich. A large producer, employing about 700 men. Organized December, 1897, under laws of Michigan, with capitalization \$2,500,000, shares \$25 par, \$18 paid in. Annual meeting, first Monday in March. John Stanton, president; John R. Stanton, secretary and treasurer; John Stanton, Joseph E. Gay, Wm. A. Paine, Samuel L. Smith, and Cameron Currie, directors; Frank McM. Stanton, agent; F. W. Denton, superintendent; Martin Trethewey, mining captain; Wm. C. Cole, clerk; F. G. Coggin, mill superintendent; W. J. Richards, master mechanic. Practically the entire stock issue of the Baltic is owned by the Copper Range Consolidated Company.

Official returns to the state of Michigan, as of date January 1, 1904, disclose the following figures:

Amount cash paid in on capital stock.....	\$1,800,000.00
Amount paid in by conveyance of property to company..	1,000,000.00
Entire amount invested in real estate.....	1,014,751.00

Amount of personal estate.....	286,376.32
Amount of unsecured or floating debt.....	105,577.74
Production of copper in 1903.....	10,580,997 lbs.

Lands, 800 acres, near the Eastern Sandstone of the Keweenaw copper belt, about 75 acres being on the sandstone and non-mineralized. Holdings comprise all of Section 21 except the southeast quarter, and the west half of Section 20, Town 54 North, Range 34 West. Lands are bounded on the north by the Wheal Kate and Section Sixteen of the Atlantic; on the east by St. Mary's Mineral Land Co., on the south by St. Mary's lands, lands of Hussey, Howe & Co. and the Trimountain mine; on the west by the Trimountain. The Baltic is $2\frac{1}{2}$ miles due south of the Atlantic, and its northernmost shaft is not quite 4 miles south of No. 10, the southernmost shaft of the Huron mine of the Isle Royale. To the southward the Trimountain and Champion mines are opened on the same lode, which has a strike of N. 63° E. from Baltic shafts 2 to 5. To the northeastward of No. 5 there is an extensive fault, not yet reached by the north drifts, and the lode is thrown some distance to the eastward. The dip of the lode averages about 73°, the sharpest of any developed cupriferous bed in the Lake district.

The Baltic shafts are numbered from south to north. No. 1, the discovery shaft, located between Nos. 2 and 3, was abandoned at a depth of 219', having been sunk at a wrong angle. The average depth of the working shafts is about 1,100'. No. 3 is 1,170' northeast of No. 2, No. 4 is 900' northeast of No. 3 and No. 5 is 855' northeast of No. 4. The extreme shafts, 2 and 5, are 3,025' apart. There is room at either end for a new shaft, but No. 6 would be cut off by the Atlantic boundary at comparatively shallow depth. No. 2 has a new engine house and hoist with 24x26" cylinders and 14' drum, capable of operating two 2-ton skips, in counterbalance, to a depth of 3,000'. The engine house at No. 3 is 38x50', of steel frame with concrete filling. The shaft-rockhouse is a 35x71' with 17x31' wing and is 88' high, of wood sheathed with steel, and has a 16x18" engine, two 18x24" Blake crushers and rock bins with 1,400 tons storage capacity. No. 4 shaft has a Nordberg conical hoist, good for a depth of 5,000'. The shaft-rockhouses at Nos. 4 and 5 are practically duplicates of that at No. 3, and No. 5 has a duplex Nordberg hoist good for 1,500' depth. No. 5 shaft is timbered to the seventh level, and the north drifts show settled ground on the sixth and seventh levels.

The Baltic amygdaloid is an exceptionally strong lode, ranging from 15' to 60' in width, and is so well mineralized that at most points it must be more or less thoroughly beaten away from wall to wall. The great width of the stopes has brought about the use of a walling system, by which waste rock is built into dry-walls along the drifts, thus saving timbering, while giving stronger walls than any timber could supply, saving the cost of hoisting lean rock. The walling system of the Baltic has been harshly criticised in some quarters but has proven a success under actual test. A little melaconite is found in narrow fissure veins crossing the lode, these being too small to follow, but the black oxide ore mined in the stopes is saved in the milling, carrying 35% to 40% copper as dressed, and smelts readily with the native copper

mineral. The native copper of the Baltic is arsenical, and it is probable that a small amount of copper arsenides are mined and milled, as narrow arsenical fissure veins occur occasionally in the district south of Portage Lake. While the product is arsenical, it makes wire of great tensile strength. The Baltic lode, taking its name from the first mine opened upon it, was discovered in 1882 but was abandoned at shallow depth because a drill-hole pitched at a wrong angle ran into the hanging wall.

The compressor house, between shafts 3 and 4, is 36x58' in size, with concrete foundations, stone walls and steel roof, housing a compressor with capacity to reduce 4,000 cubic feet of free air per minute to a pressure of 70 lbs. per inch. The mine operates about 45 power drills. Adjoining is a boiler house of similar material, 49x76', with wing 12x62', having four 250-h. p. Stirling water-tube boilers and a 140' self-supporting steel smokestack. This boiler plant supplies steam for shafts 3 and 4. Adjoining the boiler house is a 360' coal trestle, with storage capacity of 5,000 tons, underneath being a 5x8' concrete tunnel, through which coal is hauled in tram-cars on a down grade by an endless cable. There is also a complete electric plant. There is a 50x132' combination machine-shop and smithy, with stone walls and steel roof, a 42x72' carpenter shop, a 30x90' miners' changing house, supplied with hot and cold water, bath-tubs and lockers, a good office building and about 100 well-built dwellings for employees. The mine is on the Painesdale branch of the Copper Range railroad and is also reached by a branch of the Atlantic railroad.

The stampmill is at Redridge, on Lake Superior, one half mile west of the Atlantic mill, and went into commission December, 1901. The mill proper is 175x195', of structural steel on stone foundations, with 4 Nordberg stamps having 20x24" cylinders and crushing about 500 tons each, daily. Foundations for the stamps are very massive, the use of timber having been dispensed with, and 90-ton anvil plates set beneath the mortars. Eight Wilfley concentrators have displaced finisher jigs and slime tables. A compound condensing Corliss engine runs the 4 stamps and washing machinery. The discharge at the mill is 25' above mean water datum, and with the usual drop of one in ten provides for the wasting of many millions of tons of tailings by gravity alone.

The mill is heated by the Coogan & Strothenke system, air being delivered from 4 blowers, after previous heating by passing over steam coils, radiation in the coils being insured by the vacuum system. Adjoining the mill is a 55x90' boiler house, of steel frame on stone foundations, housing five 250-h.p. Stirling water-tube boilers, and a Green fuel economizer. Draft is secured by a set of duplex fans, driven by the mill engine. Behind the boiler house is a 25,000-ton coal storage yard, for the joint use of the Baltic and Atlantic mills, coal being brought to the boilers through tunnels, by gravity. The mill has centrifugal crushing rolls and a Huntington mill for regrinding.

Water for both the Baltic and Atlantic mills is furnished by a \$150,000 gravity dam across the mouth of Salmon Trout river, built jointly by the Atlantic and Baltic mines. This structure is built of steel and anchored

by its own weight, irrespective of the holding power of the rock. The plan was suggested by J. F. Jackson, of the Wisconsin Bridge & Iron Co., and the details inspected and approved by Foster Crowell, who acted as consulting engineer during construction of the dam by the Wisconsin Bridge & Iron Co., and Prendergast & Clarkson, the completed work requiring about 1,000,000 pounds of steel and 8,000 cubic yards of concrete work. The dam impounds about 1,250,000,000 gallons of water and at the river's lowest stage can furnish water to wash 5,000 tons of rock daily, 300 days each year, effecting a saving over pumping of about 2 cents per ton of rock stamped. The dam is anchored in a cement foundation of great strength, and is in five sections, with a total length of 475', the central or deepest section being 74' high, with wings of 200' on the west and 350' on the east, these being in comparatively shallow water and made with cement cores built up from excavations in bed-rock, buttressed by earth embankments. The five sections of the dam proper are all of the same general design, the central section being highest, as it is bottomed in the bed of the river, and having a wider and heavier concrete base, with a stronger steel bracing. The dam is of steel throughout, anchored in a concrete base, with braces between the crest of the dam and the extreme foot of the cement base. The following description of the central section will give an idea of the general construction of all five parts. The concrete base is 62' wide, built up from rock excavations. The resultant of all pressures gives a pressure of 2,626,000 pounds for each steel section of 8' width and 74' height. The upper 50' of the dam in this central section of 100' is inclined from the water at an angle of 45°, throwing the point of overturning within the central third of the concrete base, thus allowing an ample margin of safety. The dam is made of plates of best boiler steel, concave on the water side, 8x16' in size and $\frac{3}{8}$ " thick, riveted and caulked watertight and supported by parallel inclined "I" beams 24" thick for the full depth of 50' below the crest of the dam. On the lower section the steel plates are each 8x16' and 3-16" thick, concave, riveted and caulked, but resting directly against the concrete base. The "I" beams of the upper or main section are supported by heavy triangular frameworks of inclined steel columns and struts. The entire steel structure is anchored to a 2" steel base-plate at the bottom of the concrete by a large number of 1.5", 2" and 2.5" steel rods, of 15' to 30' length. Water is taken from the dam about 20' below the crest by three 38" riveted steel pipes, one pipe being on the Atlantic and two on the Baltic side. There is a system of valves and waste weirs, but the structure is of such a nature that it could not be injured were water to flow continuously over its crest for an indefinite period. Surmounting this structure is a trestle of the Copper Range railroad, built at the same time but in nowise a portion of the dam. The center of the railroad track is 7' above the crest of the dam, 10' down-stream. In the central sections the foundations for the feet of the trestle are all in the concrete work, elsewhere the northern piers for the trestle are separately built.

The Baltic began production in August, 1899, with one leased stamp at the Atlantic, a second stamp being leased one year later. The first stamp in

the Baltic mill was started December 19, 1901, the second in February and the third in August, 1902, while the fourth, which began work on Champion rock, in 1902, started on Baltic rock upon the completion of the Champion mill. The Baltic is fortunate in possessing a strong and well mineralized lode, and has been equally fortunate in having an experienced and highly capable management during its period of development. The growth of the property is best shown by the figures of production. In 1901 the mine made 2,641,432 lbs. of refined copper; in 1902 the output was 6,285,819 lbs., and in 1903 was 10,580,997 lbs. of refined copper secured from a mineral production of 15,267,980 lbs. and was larger in 1904. Mining profits for 1903 were \$481,447.44 and surplus earnings above all expenditures were \$397,629.17. The Baltic is one of the best of the newer Lake Superior mines, and has before it a long and highly promising life, during which it should return to its owners many millions of dollars in net profits.

BALTIMORE COPPER, SMELTING & ROLLING CO. MARYLAND.

Office and works; Baltimore, Md. Does an extensive smelting and refining business, mainly on imported mattes and blister copper.

BALTIMORE & SONORA GOLD & COPPER CO. MEXICO.

Office: 909 Maryland Trust Bldg., Baltimore, Md. J. O. Johnston, president; Chester F. Johnston, secretary. Capitalization \$5,000,000, shares \$10 par. Lands, 387 acres, in the Arizpe district of Sonora, Mexico, on the western slope of the Cananea Mountains, showing large and promising outcrops of carbonate and silicate copper ores.

BALVANERA MINING CO MEXICO.

Office: 11 Broadway, New York. Herbert T. Beatty, president; Chas. W. White, secretary and treasurer. Last heard of company was the arrest of the president at the instigation of the secretary, for alleged misappropriation of funds.

BANNER GOLD & COPPER MINING CO. WASHINGTON.

Mine office: Chelan, Okanogan Co., Wash. Dr. J. L. Jacobs, president; R. W. Eager, secretary. Main tunnel 101'. Has secured ores assaying 18% copper and \$15 to \$33 gold per ton.

BARAGUNDA MINES. INDIA.

At Baragunda, Hazaribagh, Bengal, India. Were operated 1887 to 1891, turning out about 1,000 tons of copper in five years. Ore occurs as chalcopryrite, running only 1% to 3% copper, in a gangue of micaceous schist. All ore mined was carted 24 miles to the smelter at Giridhi. Are perhaps the most promising copper properties now known in India, despite the low-grade of ore, and might be worked successfully if given rail facilities, adequate capital and good management.

SUCESION DE BARAZARTE. CHILE.

Mine office: Papos, Taltal, Antofagasta, Chile. Ernesto Gabler, superintendent. Property includes the Reventon mine, 400' deep, and the Abundancia mine, 380' deep, both opened in 1830, also the Union mine. Has steam power and employed about 50 men at last accounts.

BARE HILL MINE.**MARYLAND.**

Owned by Albert Smyser, York, Pa. An old property at Mt. Washington, Baltimore county, Maryland, showing slightly auriferous and argentiferous chalcopryite and bornite.

BARKIS & JOHNSON CO.**PERU.**

A Peruvian firm that has been a considerable shipper of 45% to 50% copper matte, presumably from the mines of the Cerro de Pasco district.

BAROTSE COPPER CO., LTD.**RHODESIA.**

Wound up. Property sold to Rhodesia Copper Co., Ltd.

BARRANCA COPPER CO.**MEXICO.**

Office: 120 Liberty St., New York. Mine office: Barranca del Cobre, Chihuahua, Mex. H. T. R. Cowell, manager. Operates La Purisima mine, producing copper, gold and silver. Main shaft 750'; main tunnel 2,100'. Has water power, 20-stamp mill, two 4' Huntington mills and a 60-ton smelter, and plans installing a 50-ton lixiviation plant.

BARSTOW MINES.**COLORADO.**

Mine office: Ironton, Ouray Co., Colo. John Geisel, superintendent. Property has developed auriferous and argentiferous copper ores.

GEWERKSCHAFT BARTHOLOMÄUS.**GERMANY.**

Office: Düsseldorf, Germany. Mine office: Wenden bei Olpe, Westfalen, Germany. Has argentiferous tetrahedrite and manganiferous spathic iron ore. Has a 65-metre shaft and employs 6 men.

BASIN-COMSTOCK CO.**MONTANA.**

Mine office: Cataract, Jefferson Co., Mont. Organized 1904, with capitalization \$500,000, by Wm. A. Kidney, et al. Holds sundry claims having a 340' shaft showing stringers of ore, under bond and lease expiring September, 1905.

BASIN GOLD & COPPER MINING CO.**MONTANA.**

Office: care of E. R. Holden & Co., 20 Broad St., New York. Mine office: Basin, Jefferson Co., Mont. Robt. B. Smith, president; M. L. Hewitt, vice-president and general manager; B. Lowinson, secretary and treasurer. Lands, 280 acres, patented, on which considerable development has been secured, tied up by litigation with scant prospects that stockholders will save anything out of the wreck.

BASIN REDUCTION CO.**MONTANA.**

Smelter office: Basin, Jefferson Co., Montana. Has some sort of close connection with the Basin & Bay State Mining Co., and is said to have been merged therewith under title of La France Copper Co.

BASIN & BAY STATE MINING CO.**MONTANA.**

Mine office: Basin, Jefferson Co., Mont. Has a large concentrator, leased to the United Copper Co. Is closely connected with the Basin Reduction Co., and it is asserted, though no statement can be secured from any interested party, that property of both companies has been merged in the La France Copper Co.

BASSETT MINES, LTD.**ENGLAND.**

Office and mines: Bassett Mines, Redruth, Cornwall, England. Henry

Trembath, chairman; Richard Rendle, secretary; Wm. James, mine manager. Capital, nominal, £120,000, but property is operated on the cost-book plan. Is primarily a tin mine, but produces a little copper. Is developed by shafts and has steam power and stamps.

BATCHELDER GROUP.

WYOMING.

Mine office: Encampment, Carbon Co., Wyo. Was sinking a shaft at last accounts.

JOHN BATES.

BOLIVIA.

Office and mine: Coro Coro, La Paz, Bolivia. Works a conglomerate carrying native copper. Has steam power and employs a small force.

BATES MINING & SMELTING CO.

MASSACHUSETTS.

Office: Gardner, Mass. Mine office: Charlemont, Franklin Co., Mass. Organized 1902, under laws of Maine, with capitalization \$200,000, shares \$1 par. Wm. H. Bates, Jr., president and general manager; Anton Scholz, Jr., secretary; J. North, mining captain. Lands about 75 acres, showing three 3' fissure veins. Ores are chalcocite, bornite and chalcopyrite, assaying up to 16% copper and \$10 gold per ton. Has one shallow shaft, one 60' tunnel and an open-cut.

BATTLE COPPER MINING CO.

WYOMING.

Office: care of Delaney & Delaney, Colorado Springs, Colo. Mine office: Battle, Carbon Co., Wyo. Organized 1898, under laws of Colorado, with capitalization \$1,500,000, shares \$1 par. W. H. Baker, president; J. V. Helm, secretary and treasurer; W. C. Leadbetter, general manager. Lands, 3 patented claims, area 54 acres, showing 9 contact veins with average estimated width of 30', length 2,000' and estimated average value of 11% copper and \$4 to \$40 gold per ton. Ore is sulphide. Has 13 shafts, of 10' to 213', with steam power, and is on line of aerial tram to the Encampment smelter.

BATTLE LAKE COPPER EXPLORATION CO.

WYOMING.

Office: 25 East Pike's Peak Ave., Colorado Springs, Colo. Perhaps same as Battle Copper Mining Co.

BATTLE LAKE TUNNEL SITE MINING CO.

WYOMING.

Office: 703 Chamber of Commerce, Chicago, Ills. Mine office: Rambler, Carbon Co., Wyo. Employs 25 men. J. W. Brooks, president; F. P. Armbruster, vice-president; H. J. Stegemann, secretary and general manager; J. L. Powell, superintendent; R. G. Legg, consulting engineer. Organized 1900, under laws of Wyoming, with capitalization \$2,500,000, shares \$1 par. Lands, 30 claims, 11 patented, area 600 acres, also 80 acres of miscellaneous lands, in the Battle Lake district. Country rocks are granite, diorite and quartzite, showing sundry veins, of which 5 are being opened, these averaging 4' in width, and carrying oxide and carbonate ores above, with sulphides below, latter carrying main values in chalcopyrite, with considerable bornite, covellite and chalcocite, giving average assays of 40.7% copper from carload shipments. Mine is opened by 500' working shaft and 3 long tunnels, with a total of about 3,600' of underground openings. Has a 120-h. p. steam equipment with hoist good for depth of 1,000' and an 8-drill Norwalk air compressor, 4 power

drills and necessary mine buildings and dwellings. It is reported that the mine shows 16' of 32% ore on the 500' level. Company is conservatively managed and has ore bodies of altogether exceptional richness, and apparently of considerable extent.

BATTLE LAKE & BATTLE CREEK MINING CO.**WYOMING.**

Office: care of N. B. Noble, Rice Lake, Wis. Mine office: Battle, Carbon Co., Wyo. Was sinking and crosscutting during 1904.

BAUMANN COPPER CO.**ARIZONA.**

Office: Prescott, Ariz. Mine office: Dewey, Yavapai Co., Ariz. Employ 12 men. H. P. Anewalt, president; Jules Baumann, secretary and manager, W. S. Goldsworthy, treasurer. Organized Aug. 3, 1901 under laws of Arizona, with capitalization \$600,000, shares \$1 par. Commercial Trust Co. of Prescott, registrar and transfer agent. Annual meeting, first Monday in December. Lands, 25 claims, area 500 acres, unpatented, in the Agua Fria district. Country rocks are quartz-porphry and slate, principal veins occurring as fissures in quartz-porphry, with heavy gouge on footwall. Ores are cuprite, malachite and azurite above, with chalcopryite below, giving assays of 14% to 40% copper, 2 oz. to 80 oz. silver and from a trace to \$35 gold per ton. Development is by tunnels of 50' and 305' and by five shafts, two deepest being 208' and 214', with a total of about 2,000' of underground openings. Main vein has been traced two miles on the company's lands, showing pay ore wherever opened. Management is thoroughly honest and development has been along businesslike lines. Property is well regarded by judges of values in its district.

SOCIEDAD MINERA y FUNDICION DE**ARGENTINA.****BAUSCH y TIANL**

Office, mine and works: Chilecito, Rioja, Argentina. Operates the San Pedro, Mercedes and other mines, producing copper, silver and lead. Has water and steam power and operates the "San Miguel" smelter, employing several hundred men.

BAXTER MINE.**CALIFORNIA.**

A prospect near the Bully Hill mine, Redding, Shasta Co., Cal.

BAY COPPER MINES, LTD.

Offices: 142, Palmerston House, London, E. C., Eng. John Robertson, managing director; W. R. Caldwell-Moore, secretary. Capital, nominal, £35,000; issued, £15,007. Location of lands, if any, unknown.

BAY HORSE COPPER MINING CO.**WYOMING.**

Mine office: Riverside, Carbon Co., Wyo. W. G. Foss, superintendent.

BEAN COPPER CO.**ARIZONA.**

Mine office: Gila Bend, Pima Co., Ariz. C. C. Bean, manager. Idle.

BEAR CREEK MINING CO.**CALIFORNIA.**

Office: 18 Naylor-Cox Bldg., Terre Haute, Ind. W. R. McKeen, president; A. W. Wright, managing director; Willard Kidder, treasurer; Henry C. Albrecht, secretary. Property is in Mariposa county, California.

BEAR GULCH MINING CO.**MONTANA.**

Office: Butte, Mont. Mine office: Twin Bridges, Madison Co., Mont.

Alex. Johnson, owner; Edson C. Baxter, superintendent. Property is the Mountain View group, carrying auriferous and argentiferous copper ores, opened by tunnel. Has steam power and employed 15 men at last accounts.

BEAR MOUNTAIN MINING & DEVELOPMENT CO. WASHINGTON.

Mine office: Colville, Stevens Co., Wash. C. G. Carruthers, superintendent. Has argentiferous and auriferous copper ore, opened by tunnel.

BEAR MOUNTAIN TUNNEL & MINING CO. COLORADO.

Mine office: Crystal, Gunnison Co., Colo. H. H. Williams, superintendent. Has argentiferous and slightly auriferous copper ores, opened by tunnel. Has water power and employs 10 to 12 men.

BEATRICE MINING & MILLING CO. MONTANA.

Mine office: Elliston, Deer Lodge Co., Mont. D. G. Barringer, president; A. McNaughton, secretary and general manager; Abner Knapp, superintendent. Ores carry gold, silver, lead and copper, opened by tunnel. Has steam power and plans building a 100-ton concentrator.

BEAVER CONSOLIDATED MINING CO. UTAH.

Merged, 1904, in Beaver-Harrison Mining Co.

BEAVER COPPER MINING CO. WYOMING.

Office: Encampment, Wyo. Mine office: Downington, Carbon Co., Wyo. Organized under laws of Wyoming, with capitalization \$1,000,000, shares \$1 par. S. H. Scofield, president and general manager; E. H. Parkison, secretary and treasurer; W. H. Parkison, superintendent. Lands, 7 patented claims, area 120 acres, showing 2 fissure veins, one with width of 40' carrying oxide ores with estimated values of 11.5% copper and \$10 gold per ton. Has a 900' tunnel and 225' shaft, with steam power, air compressor, etc.

BEAVER-HARRISON MINING CO. UTAH.

Office: 23 Eagle Block, Salt Lake City, Utah. Mine office: Milford, Beaver Co., Utah. Organized, 1904, with capitalization \$75,000, shares 5 cents par. Is a merger of the Beaver Consolidated Mining Co. and the Ben Harrison Gold & Copper Mining & Milling Co. J. J. Trenam, president and manager; E. H. Jacobs, treasurer; B. L. Corum, secretary. Lands, 21 claims, area 385 acres in the Beaver Lake district, one group being near the O. K. mine of the Majestic company, showing sundry fissure veins, opened by 2 shafts of 300' and 525', showing promising ore bodies assaying 5% to 50% copper, and up to 10 oz. silver and \$7 gold per ton. Has steam power and air compressor with necessary mine buildings. The 525' double-compartment shaft is the deepest in the district and shows a 10' ore body of good average value. Property regarded as promising.

BEAVER LAKE COPPER CO. PENNSYLVANIA.

Mine office: Bloomsburg, Columbia Co., Pa. Has secured ores assaying 17% copper. Probably idle.

BEAVER VALLEY COPPER CO. IDAHO.

Black Bird Copper-Gold Co. intended taking this title in 1903.

BECKLER RIVER GROUP. WASHINGTON.

Sold to Apex Mining Company.

BEDE METAL & CHEMICAL CO., LTD.**SPAIN.**

Offices: Hebburn-on-Tyne, Eng. General Spanish offices: Manriques, 9, Córdoba, Spain. Organized 1871, with capital, fully paid, £115,360, in £10 shares. Dividends for 1901 and 1902 were 5% each year. Sir Andrew Noble, K. C. B., F. R. S., chairman; W. W. Brown, secretary; Richard E. Carr, general mine manager; C. E. Turner, engineer. This company is primarily a manufacturer of acids and other chemical products, but secures a considerable amount of copper from the cinders of Spanish and Norwegian cupriferous pyrites. Principal mining property, area 136 hectares, is Las Herreras mine, at Puebla de Guzmán, Huelva, Spain, operated under lease from C. & J. Sundheim, this property including 7 mines, in two groups, and employing several hundred men. The main ore body is a large, irregular mass of solid cupriferous iron pyrites in schists, giving average values of 1.5% copper and 47% sulphur. Main shaft is 235', the principal workings being open-cast with two mineral floors, each about 16 meters in height. Has steam power and one locomotive. Ore as mined is placed in level-top piles 6 to 8 metres high, in open air and these are sprinkled systematically, the leach-water, carrying 2% to 2.5% copper, being drawn off through long, narrow channels, containing pig iron, and the resulting precipitate, averaging 70% to 80% copper, is dried and shipped to the company's works in England for refining. Gross production of refined copper to end of 1902 was 3,200 tons. Production in 1902 was 560 tons and in 1903 about 400 tons of refined copper.

The Killingdal Kobbervaerk, of Norway, also is operated by the Bede Company. Product is cupriferous iron pyrites carrying an average of about 2.5% copper. Production, 1904, was 1,128,960 lbs. from Spain and 654,080 lbs. from Norway, a total of 1,783,040 lbs. fine copper.

BELCHER MINING CO.**WASHINGTON.**

Mine office: Keller, Ferry Co., Wash. J. L. Harper, general manager. Has a large body of ore, said to be the greatest in northern Washington, developed by three tunnels, of which No. 3, the main tunnel, is about 1,000' in length, showing a large body of medium-grade ore carrying a 2' paystreak of very high-grade chalcopyrite on the footwall. Several carloads of ore were shipped to the Granby smelter late in 1903, giving net returns of about \$500 per car. The Washington Smelting & Refining Co. was organized late in 1904 to build a smelter to reduce the ores of this property, which is considered one of the most promising in the state.

BELENE COPPER CO.**MEXICO.**

Office: 905 Journal Bldg., Chicago, Ill. Mine office: El Copete, Sonora, Mex. Organized 1901, under laws of Arizona, with capitalization \$5,000,000, shares \$5 par. Registered and protocolized in Mexico, June 25, 1902. S. E. Hostetter, president; James Baynes, secretary and treasurer; J. J. Hardwick, general manager; Luis Killeen, assistant manager. Lands, 405 acres, in the Ures district, showing two very large sulphide ore lenses giving average assays of 12% copper, 8 oz. silver and \$10 gold per ton. Has 9 shafts, of 65' to 310' depth, and 3 tunnels, of 40' to 200' length, with about 1,500' of underground openings. Plans to install steam and electric power and build a 200-ton

smelter when nature of ores below waterline is developed. Smelter of Copete Mining Co. is on lands of the Belene. Company was unable to secure needed funds for development during 1904, but kept out of debt and hopes to raise money needed during 1905. Management is good and property is regarded as promising.

SOCIETE ANONYME BELGE POUR LA RECHERCHE ET L'EXPLORATION DES MINERAIS. ITALY.

Mine office: Massa Maritima, Grosseto, Italy. A Belgian company, operating a mine of slightly cupriferous iron pyrites.

BELL MARE COPPER MINING & SMELTING CO. NEVADA.

Merged in the Nevada Bell Copper Mining & Reduction Co.

BELLE-DOMINION COPPER MINING CO. ARIZONA.

Office and mine: Globe, Gila Co., Arizona. Organized August, 1904, with capitalization \$250,000.

BELLE OF GRANITE MINE. COLORADO.

Mine office: Granite, Chaffee Co., Colo. B. H. Pelton, superintendent. Ores carry gold, silver and copper, developed by shaft. Has steam power.

BELLE MARSH COPPER MINE. IDAHO.

A prospect, near Pocatello, Bannock county, Idaho, said to be valuable.

BELMONT MINING CO. COLORADO.

Mine office: Winfield, Chaffee Co., Colo. Jas. Beuell, superintendent. Has gold-silver-copper ores, opened by tunnel.

BELMONT MINING CO. MONTANA.

Office and mine: Butte, Silver Bow Co., Mont. Capitalization is 100,000 shares of which 95,000 shares are owned by the United Copper Co. Elliott H. Wilson, superintendent. Property is in the southeastern part of Butte. Upper levels showed good silver-copper ore, but this turned to iron at a depth of about 350'. Main shaft is 1,000', said to show a good body of argentiferous copper ore, opened by long drifts from the 400' level down.

BELMONT CHEMUNG MINING CO. COLORADO.

Mine office: Black Hawk, Gilpin Co., Colo. Wm. Mitchell, superintendent. Ores carry gold, silver and copper. Has steam power.

BELT MINES. MICHIGAN.

Owned by John H. Rice, et al, Houghton, Mich. Mines located in Ontonagon Co., Mich. First opened 1848; taken over by Belt Mines company, Ltd., in 1882, which company, by incompetence and bad management, lost about £250,000 in three years, without securing a half mile of underground openings. Fully described in Vol. II.

BELTS GAP COPPER MINE. NORTH CAROLINA.

Mine office: care of W. S. Adams, Savanna Creek, Jackson Co., N. C. Lands, 1,300 acres, in the Blue Ridge Mountains, carrying two veins, apparently averaging about 50' width and prospected for about 1,500' in length. Upper vein carries mainly disseminated chalcopryite; lower vein mainly pyrrhotite, with prospect that these veins join at depth. Has 4 short tunnels, 2 shallow shafts and 20 drill-holes, with indications favoring possession of large amount of low to medium grade ore. Assays average about 4.5%

copper and \$1.60 gold from chalcopyrite, the pyrrhotite showing nickel and traces of platinum. Owners plan development upon a considerable scale.

BEN FRANKLIN GOLD MINING CO.**WASHINGTON.**

Mine office: Bossburg, Stevens Co., Wash. A. A. Anderson, superintendent. A prospect showing auriferous copper ores.

BEN HARRISON GOLD & COPPER MINING & MILLING CO.**UTAH.**

Merged, 1904, in Beaver-Harrison Mining Co.

BEN HUR COPPER MINING CO.**WYOMING.**

Office: 710-34 South Clark St., Chicago, Ill. Mine office: Battle, Carbon Co., Wyo. Chas. G. Mason, president; Clifford M. Miller, secretary and treasurer; N. C. Bowen, superintendent. Organized November, 1902, under laws of Wyoming, with capitalization \$1,000,000, shares \$1 par. Lands, 4 claims, area 60 acres, showing 3 fissure veins, largest 40' wide and developed by a 160' tunnel, showing sulphide ore.

BENTON MINES.**CALIFORNIA.**

A group of 36 claims, in the White Mountains, 8 miles east of Benton, Mono Co., Cal., showing a limited amount of development work.

BEREHAVEN COPPER MINES, LTD.**IRELAND.**

Offices: 19, St. Swithin's Lane, London, E. C., Eng. Mine office: Allihies, County Cork, Ireland. W. L. Boyle, chairman; H. T. Adams, secretary. Capital £200,000; debentures, £100,000 authorized, £87,500 issued, at 5%. Was developing at last accounts.

JOSE BERNARDINO.**MEXICO.**

Office and mine: Nombre de Dios, Durango, Mex. Is a small operator of local copper mines.

BERSBO COPPER WORKS.**SWEDEN.**

Office and works, Bersbo, Ostergothland, Sweden. This is the smelting plant of the Aktiebolaget Atvidabergs Kopparverk.

TESTAMENTARIA DE NOEL BERTHINI.**BOLIVIA.**

Office and mines: Coro Coro, La Paz, Bolivia. Works cupriferous conglomerates, similar to those of the Lake Superior district, copper occurring native. Annual production, about 1,200 tons of mineral, averaging 90% fine copper, according to American consul at La Paz. Is the second largest copper producer of Bolivia. Has steam power and smelter and employs 300 to 400 men.

BESA y CA.**CHILE.**

Office and mine: Chañaral, Atacama, Chile. Edouardo P. Tellez, general manager. Employs about 500 men. Property includes the Andacollo, Manto, Verde and Ironton mines. Has steam power and smelter, shipping product as matte, securing an annual production of about 2,500,000 lbs. of refined copper.

BESSEMER IRON ASSOCIATION.**NEW MEXICO.**

Mine office: Hanover, Donna Ana Co., N. M. A. E. Dawson, lessee. Owns the Anson S. copper mine, which is idle.

BESSHI MINE.**JAPAN.**

Owned and operated by the Sumitomo Copper Co.

BEST CHANCE MINE.**WASHINGTON.**

Letter returned unclaimed from former mine office, Berlin, King Co., Wash.

BETTS COVE MINE.**NEWFOUNDLAND.**

At Betts Cove, Newfoundland. Worked 1874-1884; reopened by an adit in 1900, but since idle.

BEULAH COPPER CO.**WYOMING.**

Office: 113 Devonshire St., Boston, Mass. Mine office: Battle, Carbon Co., Wyo. Capitalization \$1,000,000, shares \$1 par. Frank S. Morrison, president, J. F. Leadbetter, manager. Lands, 13 claims, area 250 acres, developed by an 800' tunnel. Supposed to have been absorbed by United Exploration Co. of Boston.

BIG BUG GOLD & COPPER MINING CO.**ARIZONA.**

Office: Byrne Bldg., Los Angeles, Cal. Mine office: care of Thos. C. Job, Prescott, Yavapai Co., Ariz. J. H. Canovan, president and general manager. Lands, 62 acres, in the Big Bug district of Yavapai county.

BIG COLORADO MINING & MILLING CO.**COLORADO.**

Mine office: Gladstone, Colo. C. W. Bloodgood, manager, at last accounts. Ores carry gold, silver, copper and lead. Has electric and gasoline power.

BIG COPPER CLAIM.**BRITISH COLUMBIA.**

Office: care of Geo. B. McAulay, owner, Spokane, Wash. Mine office, Greenwood, B. C. Lands are in Copper Camp, about six miles from Greenwood. Is said to show a large amount of ore of grade above the average of the district.

BIG COTTONWOOD COPPER & GOLD MINING CO.**UTAH.**

Office: 305 Auerbach Bldg., Salt Lake City, Utah. Mine office: Brighton, Salt Lake Co., Utah. Nicholas Treweek, president; Joseph G. Fariss, secretary; Will L. Treweek, general manager. Capitalization \$1,500,000, shares \$5 par. Is developing by tunnel and is said to have a fair showing of ore.

BIG CREEK COPPER CO.**WYOMING.**

Office and mine: Encampment, Carbon Co., Wyo. L. D. Godshall, superintendent, at last accounts.

BIG HORN MINING CO.**COLORADO.**

Mine office: Pearl, Larimer Co., Colo. Has a 50' shaft on the Copper Queen group bottomed in a 5' vein said to assay 20% copper.

BIG INDEX GOLD & COPPER MINING CO.**WASHINGTON.**

Office: 419 Pioneer Bldg., Seattle, Wash. Mine office: Index, Snohomish Co., Wash. Wm. Frankfurt, president; J. C. Rathbun, secretary; A. E. Aegerter, superintendent. Organized 1902, under laws of Washington, with capitalization \$2,500,000, shares \$1 par. Lands, 15 claims, area 300 acres, 4 miles from a railroad, in the Washington district, opened by a 350' tunnel, showing ores giving average assay values of \$26 per ton in gold and copper, mainly former.

BIG INTERIOR MINE.

Mine office: Alberni, Vancouver Isld., B. C. Property is sundry lands in the interior of the island, 5,000' above sea-level, slightly developed and showing a strong outcrop of low-grade ore for nearly one mile.

BIG SHOW SILVER & COPPER MINING CO.**MONTANA.**

Mine office: Twin Bridges, Madison Co., Mont. Organized under laws of Arizona, with capitalization \$1,500,000, shares \$1 par. Lands, 4 claims. Ores carry gold, silver and copper.

BIG YANK MINING & MILLING CO.**OREGON.**

Office: 414 Abington Bldg., Portland, Ore. Mine office: Galice, Josephine Co., Ore. J. C. Mattison, superintendent. Has auriferous and argentiferous copper ores, and employed 10 men at last accounts.

BIGELOW GOLD & COPPER MINING CO.**NEW MEXICO.**

Office: 49 Exchange Place, New York. Mine office: Hillsboro, Sierra Co., N. M. Organized, 1903. Wm. Buchanan, president and treasurer; J. H. Bigelow, secretary.

BILBAINOS GROUP.**SPAIN.**

Office: care of Aznar y Ca., owners, Bilbao, Spain. Mine office: Paimogo, Huelva, Spain. Property is the eastward extension of La Romanera group, and is considered of promise.

BILLION DOLLAR QUEEN MINING CO.

A stock-jobbing scheme promoted by one Mrs. Van Arsdale, née Estella Trunnell, alias Mrs. Estella True-Nell, a petticoat grafter of the Cassie Chadwick stamp.

BINGHAM CONSOLIDATED MINING & SMELTING CO.**UTAH.**

Offices: 60 State St., Boston, Mass., and 700 McCornick Bldg., Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. Smelter office: Murray, Salt Lake Co., Utah. Organized April 5, 1901, under laws of Maine, with capitalization \$10,000,000, shares \$50 par, non-assessable and full paid; issued, \$7,500,000. Has an authorized bond issue of \$1,000,000. Succeeded the Bingham Copper & Gold Co., organized 1898. Edw. L. White, president; Herbert W. Wesson, secretary; O. E. Weller, treasurer; Duncan McVichie, manager; Jos. A. Coram, O. P. Posey, John W. Weeks, E. L. White, C. K. McCornick, W. S. McCornick, Peter L. Kimberly, W. F. Hammett, L. T. Trull and Wm. Bayly, directors; B. W. Rogers, mine superintendent; W. H. Nutting, smelter superintendent; H. G. Heffron, purchasing agent and ore buyer. Lands, about 300 acres, in the Bingham or West Mountain district, including the Dalton & Lark, Antelope, Brooklyn, Commercial, Miner's Dream, Sampson, Old Hickory, Vernard, Bingham and sundry other mines and claims. Company also owns an interest of 231,500 shares in the Tesora mine, of the Tintic district, and about 190,000 shares out of 250,000 in the Eagle & Bluebell property. The Bingham properties have a considerable variety of ores, principally sulphides, with gold and silver-lead values at and near surface, changing to auriferous and argentiferous chalcoppyrite at depth, later averaging 2.5% to 3% copper, with gold and silver values of about \$2 per ton. Some of the ore is rich in

iron, hence desirable for fluxing, as most of the ores of the district are highly silicious and deficient in iron.

The Dalton & Lark mine has shafts of 850' and 1,150', bottom level showing ore carrying 7% copper and 60 oz. silver. There also are 4 tunnels, one with electric haulage plant. The Mascot tunnel, 6,200' long, drains the Dalton & Lark, and eventually will drain the Brooklyn and Miner's Dream mines also. This tunnel, planned both for drainage and mining, will effect an ultimate saving of perhaps \$1 per ton in pumping and extraction costs. The Mascot should cut all the working ore bodies of these mines, several hundred feet below present bottom levels, about the close of 1905. The Brooklyn mine, 1,600' deep, shows a strong vein of 20' to 25' width on the three lower levels.

The Commercial mine has shown marked improvement during 1904, and is a valuable property. The ores include considerable auriferous galena, also auriferous and argentiferous copper ores carrying values of about \$4 per ton, with an excess of iron, and valuable chiefly for fluxing purposes. The Lead mine opened a new body of 3% to 4% copper ore in 1904. The Sampson mine carries auriferous galena and auriferous and argentiferous chalcopyrite. The Tesora, in the Tintic district, has not proven an especially valuable acquisition.

The Eagle & Bluebell mine, at Eureka, controlled through a preponderant stock ownership, carries good values in gold, silver, lead and copper. The main vein is said to show 60' of workable ore, and the showing on the 750' level is notably good. Present production of the Eagle & Bluebell is about 75 tons daily, but a new shaft was sunk and fitted with powerful machinery in 1904, and the mine's production should be considerably increased in 1905. The mine of the Fortune Mining & Milling Co., at Bingham is held under lease from the owners, and is a producer. The various mines of the Bingham have several years ore reserves developed, the ores ranging from rich to poor.

The smelter, at Murray, 13 miles from the mine, was blown in January 31, 1901. The building is 150x400' in size, with steel frame on stone foundations, steel and cement floors and iron sides and roof, the only wood in the structure being the ore-bin partitions. Plant is terraced, allowing the handling of material by gravity. There are five 200-ton 42x172" water-jacket blast furnaces, of which 3 are in commission regularly, smelting about 20,000 tons of ore monthly. The smelter has both steam and electric power, with a 1,000-h. p. Rarig blowing-engine, Stirling water-tube boilers and automatic stokers. The pyritic smelting system is used, ores being smelted to low grade matte and resmelted with silicious sulphides, producing a matte of 30% to 35% in tenor, which is blown up to blister copper averaging 98.35% in tenor and carrying average gold and silver values somewhat greater than the value of the copper itself. Adjoining the smelter building is a 375' dust chamber, with a 200' steel smokestack 12' in diameter. The conversion plant has six 10-ton shells, 7x10' 6", with 2 stands. There is also a 100-ton briquetting plant, for flue dust. The construction of a 1,000-ton

sampling mill is said to be under advisement. The Bingham management planned the building of a lead furnace, but the American Smelting & Refining Company "viewed with alarm" this threatened attack upon the highly profitable lead-smelting monopoly enjoyed in Utah, hence a trade was made by which the Bingham abandoned the construction of its proposed lead smelter and surrendered the lead-smelting contract of the Honerine mine, receiving in exchange profitable smelting contracts with the Utah Copper Co., and the Newhouse Mines and Smelters.

The 1904 production of the Bingham was about 11,500,000 lbs. refined copper, of which about 40% came from custom ores. At present about 20,000 tons of ore are being smelted, of which about 25% are custom ores. The company is earning considerable profits, and shareholders are inclined to clamor for dividends, which the company could pay if it wished, by "standing pat" upon its present properties. It is a question, however, whether the present management may not prefer to continue its former policy of absorbing or leasing additional mines, a policy which adds to the value of the company's holdings, but precludes the payment of dividends.

BINGHAM COPPER BOY MINING CO.**UTAH.**

Office: 14 West First South St., Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. Organized under laws of Utah, with capitalization \$1,500,000, shares \$1 par. A. Hanauer, Jr., president; J. H. Hurd, secretary; W. A. Cooke, treasurer and manager; J. B. Taylor, superintendent. Lands, 11 claims, area 152 acres, in the West Mountain and Tooele districts, adjoining the Highland Boy mine of the Utah Consolidated on the west, showing several veins carrying ores of copper, lead, silver and gold, some of which have given assays up to \$90 per ton. Ore on the dump assays 2% to 4.5% copper. Is developing by an 800' crosscut tunnel and a lower tunnel of 2,000', showing 3 different veins, with nearly a mile of underground openings. Also owns the Great Divide group of 33 claims, area 526 acres, with 1,200' of underground openings, showing large bodies of low-grade ore. Company is said to plan building a concentrator. Management considered good and property promising.

BINGHAM COPPER-GOLD MINING CO.**UTAH.**

Mine office: Silver City, Juab Co., Utah. James Creighton, superintendent. Ores carry gold, silver and copper. Has steam power and a 100-ton concentrator.

BINGHAM & EASTERN COPPER MINING CO.**UTAH.**

Reorganized, 1903, as Bingham & Eastern Mines Co.

BINGHAM & EASTERN MINES CO.**UTAH.**

Office: 42 Church St., New Haven, Conn. Mine office: Bingham Canyon, Salt Lake Co., Utah. Is the old Bingham & Eastern Copper Mining Co., reorganized with present title in 1903, under laws of New Jersey, with a reduction of capital from \$1,000,000 to \$200,000. Lands include the Jersey Blue, I X L, Little Cottonwood and other mines, which have been occasional shippers since circa 1890, and are opened by a 1,400' tunnel. Property is well located and with proper development might make a mine.

BINGHAM & EASTERN MINING CO.**UTAH.**

Now Bingham & Eastern Mines Company.

BINGHAM-NEW HAVEN COPPER & GOLD MINING CO.**UTAH.**

Office: 703 Malloy Bldg., New Haven, Conn. Mine office: Bingham Canyon, Salt Lake Co., Utah. Employs 68 men. Louis E. Stoddard, president; Thos. W. Farnam, secretary and treasurer; Frank A. Taylor, superintendent; Geo. H. Robinson, consulting engineer. Organized October, 1902, under laws of Utah, with capitalization \$2,000,000, shares \$5 par. Bonds, \$200,000 authorized, at 6%; issued, \$78,250. Lands, 20 claims, area about 400 acres, adjoining the Utah Consolidated, in the West Mountain district, including the Zelnora mine, which has been a considerable producer. Veins occur as contacts between limestone and quartzite, ores carrying copper, gold, silver and lead values. Property is served by the Copper Belt Railroad. Company is practically a close corporation and ores are of high grade, and are sold on a five-year contract to the Murray works of the American Smelting & Refining Co. Property is well handled and has reached a stage of development where a prosperous future seems assured.

BINGHAM & SALT LAKE MINING CO.**UTAH.**

Letter returned unclaimed, from former office, 64 East Second St., Salt Lake City, Utah.

BINGHAM WEST DIP TUNNEL CO.**UTAH.**

Office: Salt Lake City, Utah. Mine office: Tooele, Tooele Co., Utah. Capitalization, \$100,000, shares one cent par. F. M. Lyman, president; Milando Pratt, secretary; F. M. Bishop, treasurer. Lands, circa 520 acres, unpatented. Development is by a 375' tunnel, planned to be driven about 4 miles to cut the ore bodies of various Bingham mines at great depth. Has steam power and air compressor.

BIRD, McCABE & KING.**MONTANA.**

Mine office: Corbin, Jefferson Co., Mont. Are said to hold, by location and purchase, 175 mining claims in the Corbin district, and to have sunk three 2-compartment shafts upon claims showing outcrops of bornite and chalcopyrite.

BIRTHDAY COPPER SYNDICATE.**TASMANIA.**

Owens 510 acres of mineral lands, carrying a fair showing of copper ore, near the coast and about 20 miles from Macquarie Heads, Tasmania.

BISBEE-ARIZONA GOLD & COPPER MINING CO.**ARIZONA.**

Office and mine: Postoffice Bldg., Bisbee, Cochise Co., Ariz. Employs 12 men. Organized Dec. 27, 1902, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par; unissued, \$350,000, M. D. Scribner, president; Frank H. Bopp, secretary; Jacob Schmidt, treasurer; M. R. Harlan, general manager. Lands, 14 claims, area 280 acres, unpatented, in the Warren district, about 7 miles northwest of Bisbee, near the Modern mine, said by company to show 7 contact veins between limestone and porphyry, of which 2 veins averaging 6' width are being developed, said by company to give average assays of 6% copper, 40% lead and 40 oz. silver per ton. Develop-

ment is by tunnels of 40' and 70' and 5 shafts of 30' to 120'. Company is said to be expending about \$2,000 per month in development work.

BISBEE BELLE COPPER CO.

ARIZONA.

Office: 401 Laughlin Bldg., Los Angeles, Cal. Mine office: Wickenburg, Maricopa Co., Ariz. Organized under laws of Arizona, with capitalization \$1,250,000. Geo. M. Case, president; Geo. Van Derwerker, secretary. Lands, 25 claims, in the Wickenburg district, opened by 4 shafts, deepest 150', and a 600' tunnel, showing ores giving assays up to 30% copper and \$2 gold per ton, with traces of silver, also sundry claims in the Warren district, Cochise Co., Arizona.

BISBEE CONSOLIDATED COPPER CO.

ARIZONA.

Office and mine: Bisbee, Cochise Co., Ariz. R. L. Samuel, president and general manager; Emil Marks, vice-president; F. A. Hess, secretary; W. J. Lewis, treasurer. Organized 1902, under laws of Arizona, with capitalization \$1,000,000, shares \$5 par; unissued, \$100,000. Lands, 18 claims, area, 360 acres, northwest of the Copper Glance, one-half mile from El Paso & Southwestern Ry., in the Warren district, showing a heavy conglomerate capping over limestone, opened by a 200' shaft. Has steam power and 54-h. p. hoist, good for depth of 1,500'.

BISBEE COPPER DEVELOPMENT CO.

ARIZONA.

Office: care of Alfred M. Low, Detroit, Mich. Lands, the Union group, area 35.4 acres, in the Warren district, Cochise Co., Arizona, held under bond and lease, on which \$40,000 has been paid and \$238,989.98 remains unpaid. Stockholders were engaged in litigation among themselves at close of 1904.

BISBEE GOLD & COPPER MINING CO.

ARIZONA.

Office and mine: care of M. R. Harlan, Bisbee, Cochise Co., Ariz. Lands adjoin the Modern mine.

BISBEE MINING CO.

ARIZONA.

Dissolved, 1904.

BISBEE QUEEN DEVELOPING CO.

ARIZONA.

Office and mine: care of B. F. Graham & Co., Bisbee, Cochise Co., Ariz. Organized April 20, 1903, under laws of Arizona, with capitalization \$1,000,000, shares, \$5 par. Lands, 27 claims, lying between the Portage Lake & Bisbee and Pittsburg & Hecla. No work in progress. Title to lands in dispute, but litigation settled in company's favor in 1904.

BISBEE-QUINCY COPPER MINING CO.

ARIZONA.

Office: care of Southwestern Securities Co., H. W. Hellman Bldg., Los Angeles, Cal. Mine office, Bisbee, Cochise Co., Ariz. Capitalization, \$1,000,000, shares \$1 par. Lands, sundry claims in the Warren district.

BISBEE & SUPERIOR DEVELOPMENT CO.

ARIZONA.

Dissolved, 1904, with all debts paid.

BISBEE WEST COPPER MINING CO.

ARIZONA.

Office: Los Angeles, Cal. Mine office: Bisbee, Cochise Co., Ariz. Organized Oct. 25, 1899, under laws of Arizona, with capitalization \$4,000,000, shares \$1 par. A. S. Robbins, president; Fred. L. Dwight, superintendent;

James Smith, foreman. Lands, about 440 acres, in the extreme western part of the Warren district, opened by shafts of 550' and 750', with a considerable amount of development work showing much water and no ore. Company apparently out of funds and property considered too far west of the Bisbee mines to be of much promise.

KUPFERERZ GEWERKSCHAFT BISMARCK.

GERMANY.

Office and mine: Hanover, Braunschweig, Germany. Organized Nov. 20, 1899. Property is various iron and copper mines, including the Morgenrothe in Brunswick, and the Rothbart in Prussia, carrying malachite and other copper ores, and iron ore mines near Ruhla, Saxe-Weimar.

BISMARCK-NUGGET GULCH CONSOLIDATED MINING CO.

MONTANA.

Office: Stock Exchange Bldg., Chicago, Ill. Mine office: Brandon, Madison Co., Mont. Louis D. McCall, president. Capitalization, \$5,000,000. Lands, 17 copper claims and 18 gold claims, in 3 groups, the copper claims being on Stone Creek, in the Ruby Mountains. Has a 60-ton concentrator and 30-ton smelter. Confines attention to gold mining, but copper claims are said to be promising.

BISON MOUNTAIN MINING CO.

MONTANA.

Mine office: Elliston, Deer Lodge Co., Mont. Ores carry gold, silver, copper and lead. Has steam power.

BITTER MOUNTAIN MINING CO.

Started as a copper mining company, but found no copper. Moribund.

BITTER ROOT COPPER MINING CO.

MONTANA.

Lost its lands through inability to meet bond payments.

BLACK BUTTE MINING & REDUCTION CO.

ARIZONA.

Office: Phoenix, Ariz. Mine office: Castle Creek Hot Springs, Yavapai Co., Ariz. Idle. Organized under laws of Arizona, with capitalization \$750,000, shares \$1 par; unissued, \$400,000. T. Connell, president and treasurer; M. Thompson, secretary; J. C. Dobbins, general manager. Lands, 5 claims, area 102 acres, held by location, in the Castle Creek district, 26 miles from Santa Fé, Prescott & Phoenix R. R., showing fissure veins in shales, 3 veins averaging 8' width showing cuprite, azurite, malachite, chalcocite and atacamite, opened by a 220' tunnel and 170' shaft. Has steam power and necessary mine buildings. For 1905 company plans sinking shaft to depth of 700' and drifting on the 100' level. Development as yet is within the leached zone, atacamite being the predominant ore, this occurring in a pay-streak of 12" to 18" along the foot-wall and giving average assays of 34% copper.

BLACK BAY MINING CO.

ONTARIO.

Office: Willmar, Minn. G. P. Carwand, president; N. B. Carlson, secretary. Organized November 5, 1901, under laws of Arizona, with capitalization \$1,000,000. Lands, 3 crown-granted claims, area 266 acres, also 13 acres miscellaneous lands, all heavily timbered, in the Thunder Bay district of Algoma, Ontario. Country rock is trap, showing 7 amygdaloidal cupiferous beds, claimed by company to average 2% native copper, 1.25 oz. silver and \$2 gold per ton.

BLACK BESS MINE.**UTAH.**

Located in the Big Cottonwood district of Utah. Made small shipments of copper and lead ores during 1903.

BLACKBIRD COPPER & GOLD MINING CO.**IDAHO & UTAH.**

Office: 519 Dooly Bldg., Salt Lake City, Utah. Mine office: Salmon, Lemhi Co., Idaho, and Frisco, Beaver Co., Utah. J. W. Russell, president; D. W. Kimball, secretary and treasurer; Dr. P. A. H. Franklin, manager; Geo. S. Fitzwater, superintendent in Idaho; Peter M. McCrea, superintendent in Utah. Lands, 27 patented claims and sundry locations in Idaho, latter having steam power and employing 15 to 20 men and having made small smelter shipments returning 17% copper and \$8 gold per ton. Utah lands are 42 patented claims and 61 claims held by location, total area about 2,000 acres, adjoining the Cactus mine of the Newhouse company, on which a large shaft has been started. Company planned changing its name to Beaver Valley Copper Co. Considerable development has been secured and the property is regarded as promising, especially the Utah holdings, on which nothing but the compulsory assessment work was done during 1904.

BLACK CANYON COPPER CO., LTD.**ARIZONA.**

Office: 13 Mills Bldg., San Francisco, Cal. Branch office: 315 Fleming Blk., Phoenix, Ariz. Mine office: Mayer, Yavapai Co., Ariz. Dr. O. A. Lindstrom, president; Chas. E. Nathhorst, vice-president and general manager; K. M. Lundberg, secretary and treasurer. Organized under laws of Arizona, with capitalization \$1,000,000, shares \$5 par. Lands, 5 claims, area 100 acres, in the Black Canyon district, showing auriferous and argentiferous oxide, carbonate and sulphide ores, and a little native copper, developed by a 200' tunnel and several shallow shafts and open cuts. Property regarded as promising.

BLACK CHIEF MINE.**ARIZONA.**

Office and mine: care of Timothy Fell, owner, Dewey, Yavapai Co., Ariz. A prospect showing a limited amount of development work.

BLACK DIAMOND MINING & DEVELOPMENT CO.**WYOMING.**

Office: care of Perry F. Powers, Cadillac, Mich.

BLACK COPPER CO.**NEW MEXICO.**

Mine office: Elizabethtown, Colfax Co., N. M. A gold producer only.

BLACK DIAMOND COPPER MINING CO.**ARIZONA.**

Office: 99 John St., New York. Mine office: Pearce, Cochise Co., Ariz. Organized 1898, under laws of West Virginia, with capitalization \$2,000,000 shares \$5 par. E. D. Kennedy, president and general manager; Dr. T. M. Sabin, secretary. Lands, 35 claims, area about 500 acres, 6 miles from Pearce, in the Cochise mountains. Ores occur as contact veins between limestone and porphyry, with parallel dykes of sandstone and quartzite, having a heavy gossan capping, in places 150' wide. Ores are almost exclusively sulphide, being mainly chalcopyrite and bornite, with iron and silica gangue, estimated to average better than 6% copper, 10 oz. silver and \$1.40 gold per ton, with about 38% of silica. Property was opened originally for silver. Development is by 4 tunnels, lowest 600' below crest of the hill,

tunnels being connected by winzes. Mine is connected with smelter by a $1\frac{1}{2}$ mile Leschen aerial tramway having a drop of 800', with 600 tons daily capacity. Has a pumping plant with 4" pipeline installed at Pearce, this having capacity to raise 100,000 gallons daily against a head of 804' in 6 miles, with a 350,000-gallon storage reservoir at the mine. Property has a good steam equipment, including two air-compressors with 15-drill capacity, petroleum being used for fuel. Miscellaneous improvements include a 20-room hotel, store, schoolhouse and a considerable number of dwellings. A 200-ton smelter, built 1902, has a 44x120" Allis-Chalmers rectangular water-jacket blast furnace, a 38" auxiliary cupola and a 24x36' circular roaster, and made a matte carrying about 65% copper, and 150 oz. to 300 oz. silver per ton, with small gold values. Ores are self-fluxing, and easily smelted, and furnace is claimed to have shown slag losses of only 0.3% copper. Company apparently bankrupt and mine and smelter idle.

BLACK DIAMOND TUNNEL CO.**BRITISH COLUMBIA.**

Office: 604 Land Title Bldg., Philadelphia, Pa. Maxwell Stevenson, president; Henry M. Stevenson, secretary. Lands are in the Ainsworth district of British Columbia, and company has been driving a continuation of the Highlander tunnel, having a total length of about 3,000', which has cut 3 veins of 4' to 13', giving fair assays in silver, lead, copper and gold. Officers are men of good standing, but the company's advertising made preposterous claims regarding future earnings and immediate dividends. Only the excellent local standing of the officers of the company stands in the way of denouncing this concern as a stock-jobbing swindle.

BLACKFOOT COPPER CO.**MONTANA.**

Succeeded, 1901, by Imperial Montana Copper Mining, Smelting & Water Power Co.

BLACKFOOT MINING & MILLING CO.**WYOMING.**

Property supposed to be in the vicinity of Battle, Carbon Co., Wyo. H. M. Shields, superintendent, at last accounts.

BLACK FOREST GROUP.**NEVADA.**

Mine office: Wells, Elko Co., Nev. C. M. Spence, owner and manager. Ores carry copper, gold, silver and lead. Has water power and a small smelter.

BLACK HILLS COPPER CO., LTD.**ARIZONA.**

Office: 516 Grant Bldg., Los Angeles, Cal. Mine office: Jerome, Yavapai Co., Ariz. Idle. R. A. Thomas, president; J. R. Thomas, secretary and treasurer; Ed. Beven, superintendent. Organized July, 1899, under laws of Arizona, with capitalization \$3,000,000, shares \$1 par. Lands, 9 claims, area 160 acres, in the Verde district, opened by a 352' vertical main shaft, and a 212' incline shaft, with tunnels of 225', 391', 363' and 1,002'. Has steam power, air compressor and necessary mine buildings. Property idle, but company is out of debt, and intends remaining so. Lands are located between the United Verde and Equator, and are regarded as promising.

BLACK HILLS COPPER CO.**SOUTH DAKOTA.**

Office: Benton Harbor, Mich. Mine office: Rochford, Pennington Co.,

S. D. Employs 12 men. Organized June 2, 1900, under laws of South Dakota, with capitalization \$2,000,000, shares \$1 par. John E. Barnes, president; Geo. M. Thresher, secretary; John Robinson, treasurer; John B. Taylor, superintendent. Lands, 27 claims, area 510 acres, in the Hornblend district, showing fissure veins in slate with heavy gossan capping, carrying carbonate and oxide ores. The ore body under development is said by company to average 20' width, and to be more than a mile in length, opened by incline shafts of 800', 40' and 75', with crosscut tunnels of 65' and 300', giving a total of about 1,200' of underground openings. Ores carry average values of 1.5 to 3% copper, and a carload shipment of carbonate ore gave smelter returns of 16.31% copper. The ore also contains small values in gold, silver and nickel. Has steam power with 60-h. p. hoist, good for 1,500', and 4 power drills. Company plans sinking to find sulphide ores at depth. Company is considered to have an honest management.

BLACK HILLS & DULUTH COPPER MINING CO. SOUTH DAKOTA.

Mine office: Custer, Pennington Co., S. D. Capitalization, \$3,000,000, shares \$1 par. F. A. Towner, president; M. J. Bailey, secretary; W. F. Hanley, treasurer; W. A. Nelson, superintendent. Lands, 340 acres, 8 miles northwest of Custer, adjoining the Central Black Hills Copper Co., showing promising outcrops of argentiferous and auriferous copper ores, which have given assays up to 20% copper. Has water power, and is developing by means of two shafts.

BLACK HILLS GOLD & COPPER MINING CO.

ARIZONA.

Office: care of R. H. Burnister, general manager, Prescott, Yavapai Co., Arizona. Property presumably in Black Hills of Yavapai county.

BLACK MARIA & SILVER BELLE MINES.

IDAHO.

Mine office: Mineral, Washington Co., Idaho. A. J. Crook, superintendent at last accounts. Mine opened by tunnel and shaft. Ores carry copper and silver. Has steam power and a 20-ton smelter.

BLACK MOUNTAIN MINING CO.

MEXICO.

Office: 1018 Tribune Bldg., Chicago, Ills. Mine office: Magdalena, Sonora, Mexico. Organized 1904, with capitalization \$2,000,000, shares \$5 par, paid in, \$1. Is a reorganization of the Nogales Copper Co., shareholders of the Nogales being given one share of the Black Mountain for two shares of Nogales. Wm. Z. Stuart, president and treasurer; F. S. Sensenbrenner, secretary.

Lands include sundry copper claims in the Patagonia and Pajorita districts of Santa Cruz Co., Ariz., described in Vol. IV, but which will be allowed to remain idle for the present, also the Cerro Prieto gold mines, 38 miles from Magdalena, and connected therewith by a good wagon road. Company's lands carry about 11,000' of the Cerro Prieto vein, which is 3 miles long and runs 20' to 100' in width. Ore body is low-grade gold-bearing porphyritic quartz, from which the old mill on the property is said to have secured returns of about \$7 per ton. Mine is opened by tunnels, permitting cheap extraction. Company plans erecting a 120-stamp mill, eventually to

be increased to 480 stamps, also a cyanide plant for treating the valuable tailings previously lost. It is planned to transmit power electrically from Magdalena to the mines, equipping the power plant at Magdalena with triple expansion engines, the location of the plant at that point, on the railroad, insuring a regular and economical supply of fuel. Property is one of exceptional promise and management is excellent.

BLACK PEAK GOLD & COPPER MINING CO. NEW MEXICO.

Lands, 6 claims, with about 2,000' of development work, said to show about 5,000 tons of shipping ore, in Sierra county, New Mexico.

BLACK PRINCE COPPER CO. ARIZONA.

Office: care of Chas. F. Potter & Co., Minneapolis, Minn. Letters returned unclaimed from former mine office, Pearce, Cochise Co., Ariz. Lands, 7 claims, area 140 acres.

BLACK ROCK GOLD & COPPER MINING CO. ARIZONA.

Office: 1133 Stock Exchange Bldg., Chicago. Organized under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Wm. D. Powell, president; Frederick S. Breen, secretary and treasurer; M. W. Breen, fiscal manager. Lands, 20 claims, area 400 acres, in 2 groups, in Yavapai Co., Ariz., one of these claims lying about four miles from the United Verde and the other lying about 20 miles south of the United Verde. Upper group is opened by a 150' two-compartment shaft, said to show a vein of 4' to 8' width; lower group has shafts of 60' and 75'. Assays of ore are said to run from \$15 to \$80 per ton. Officers are men of good standing, but company's prospectus contains a number of misleading statements.

BLACK ROCK MINE. MONTANA.

Office and mine: care of Hon. W. A. Clark, Butte, Silver Bow Co., Mont. Was formerly an important silver producer, and is being reopened for copper.

BLACK ROCK MINING CO. ARIZONA.

Mine office: Wickenburg, Maricopa Co., Ariz. Lands, 9 claims, area 180 acres, in the Bradshaw Mountains, 17 miles from rail connection at Wickenburg. Country rocks are granite and syenite, showing 4 fissure veins, averaging about 30' width, carrying copper, lead, gold and silver with quartz gangue, and also showing porphyritic dykes carrying low-grade ores. Development is by several shallow shafts and short tunnels. Has gasoline power, and was developing with a small force at last accounts.

BLACK TIGER COPPER MINING CO. WYOMING.

Mine office: Encampment, Carbon Co., Wyo. Capitalization \$1,000,000, shares \$1 par. Fennimore Chatterton, president; Bernard McCaffrey, secretary. Lands, about 103 acres. Officers are men of excellent standing, but the eastern promoters were little hampered by the truth in selling stock.

BLACK TIGER MINE. COLORADO.

Mine office: Red Cliff, Eagle Co., Colo. J. F. Fleming, superintendent. Has ores carrying gold, silver and copper, opened by tunnel.

BLACK WARRIOR COPPER COMPANY, ALMAGAMATED. ARIZONA.

Office: 1420 Chestnut St., Philadelphia, Pa. Mine office: Black Warrior, Gila Co., Ariz. Ernest L. Tustin, secretary. Capitalization, \$2,500,000,

shares \$10 par. Lands, 1,500 acres, in 3 groups, the Gold Gulch, Diamond H. and Montgomery, latter including the Montana and Dadeville mines, adjoining claims opened by tunnels of 1,000' and 1,200', with about 3,000' of underground openings showing a vein of 20' to 60' width, carrying silicious ores assaying up to 6% copper. Has a steam plant, burning petroleum. Reduction plant includes a 50-ton matting furnace, 100-ton concentrator and 300-ton leaching plant, latter having six 50-ton square tanks, each 10x25' and 5' in depth, in a building 62x130'. Tanks are heated by steam coils, facilitating the lixiviation of copper values. Crushed ore is delivered to tanks from a railroad track running above, which is to be replaced by a belt conveyor. While this property has large ore bodies, and has expended about \$500,000 in development, it never became a steady producer and property is idle, with a \$50,000 suit pending against former president, James A. Fleming. Property has been mismanaged, and its actual value, or lack of it, can be determined only by the test of operation under a competent management.

BLACK WARRIOR GROUP.**BRITISH COLUMBIA.**

Letter returned unclaimed from former mine office, Alberni, Vancouver Island, B. C. Owned by A. Watson, et al. Slightly developed by tunnel and open-cuts. Has secured assays of 15% copper, \$3 silver and \$2 to \$12 gold per ton.

BLANCHE COPPER MINING CO.**WYOMING.**

Office: 432 Omaha National Bank Bldg., Omaha, Neb. Mine office: Encampment, Carbon Co., Wyo. H. E. Owen, president; Jas. H. Kyner, secretary; Arthur H. Crow, general manager. Organized April 2, 1902, under laws of Wyoming, with capitalization \$1,000,000, shares \$1 par. Lands, 5 claims, near the New Rambler, on which a slight amount of development work shows two veins, one of which, 3' to 5' wide, shows auriferous oxide, carbonate and sulphide ores. Has steam power and employs about 10 men. Management is well regarded.

BLANCHE MINE.**NEW MEXICO.**

Office and mine: Organ Donna Ana Co., N. M. Owned by W. H. Mackay, Jr.

BLAND MINE.**ARIZONA.**

Mine office: Patagonia, Santa Cruz Co., Ariz. Powers, Clark & Heck, owners. Was driving a tunnel to develop ores carrying copper, silver and gold, at last accounts. Presumably idle.

BLAYNEY MINING & SMELTING CO.**AUSTRALIA.**

Mine office: Blayney, N. S. W., Australia. S. Remfry, manager. Capitalization, £100,000. Lands, 50 freehold claims, including the mine variously known as the Blayney, Great Blayney and Annandale, reopened in 1897 by the present owners. Has a 40' vein, carrying chalcoppyrite disseminated in andesite, opened by a 390' shaft. Has steam power and a 50-ton smelter with 2 water-jacket furnaces. Produced 418 long tons of copper from 18,666 tons of ore smelted in 1901.

BLEDSE GOLD MINING & LEACHING CO.**COLORADO.**

Mine office: Kokomo, Summit Co., Colo. Henry Pomeroy, superintendent. Ores carry gold, silver, lead and copper.

BLINMAN COPPER MINING CO.**AUSTRALIA.**

Office: 107, Queen St., Melbourne, Victoria, Australia. J. M. Higgins, manager. Operates the Blinman mine, in the Flinders range, South Australia, 272 miles north of Adelaide. Mine opened 1862, reopened circa 1899. Lands, 640 acres. Deepest shaft, 450'. Ore averages 8% copper, as mined, and is concentrated to 23% for shipment to smelter, hand-picked ores ranging 30% to 40%. District is arid, causing much trouble from inadequate water supply. Employs about 75 men. Annual capacity, about 1,250,000 lbs. refined copper.

BLUE ACRE COPPER CO.**UTAH.**

Office: 409 Dooly Blk., Salt Lake City, Utah. Mine office: Blueacre, Beaver Co., Utah. Employs about 10 men. Capitalization, \$600,000, shares \$1 par. Henry M. Crowther, president and general manager; Wallace W. Wait, vice-president, secretary and treasurer. Lands, 17 claims, area 320 acres, in the Beaver Lake district, showing 5 contact and fissure veins, of which three of good average width are being developed, these carrying estimated values of 6% copper, 5 oz. silver and \$4 gold per ton from oxide, carbonate and sulphide ores, opened by 4 shallow shafts. Property regarded as promising, though but slightly developed, and company has secured good results for modest expenditures made.

• **BLUE BELL COPPER MINING CO.**

Office: 36 Swiss St., Cleveland, Ohio. No replies to repeated requests for information and apparently moribund.

BLUEBELL MINE.**ARIZONA.**

Mine office: Johnson, Cochise Co., Ariz. Weir & Mitchell, owners; T. K. Mitchell, superintendent. A prospect with a limited amount of development work.

BLUE BELL MINING CO.**CALIFORNIA.**

Office: care of J. J. Sullivan, Quincy, Cal. Lands, near Hosslekuss's, Plumas county, California.

BLUE BIRD COPPER-GOLD MINING CO.**UTAH.**

Office: care of M. J. True, secretary and general manager, Salt Lake City, Utah. Mine office: Milford, Beaver Co., Utah. Lands are near the Hickory group of the Majestic company. Main shaft, 275'. Property thought to be valuable, but company in financial straits.

BLUE BIRD MINING & SMELTING CO.**WASHINGTON.**

Mine office: Darrington, Snohomish Co., Wash. Was driving a tunnel, with Thos. Parks, superintendent, at last accounts.

BLUE CREEK COPPER MINING CO.**WASHINGTON.**

Letter returned unclaimed from former office; Spokane, Wash.

BLUE GROUSE CLAIMS.**BRITISH COLUMBIA.**

Lands adjoining the Yreka on the southeast,

BLUE HILL COPPER MINES.**MAINE.**

At Blue Hill, Me. An unsuccessful property. Idle many years.

BLUE JACKET CONSOLIDATED COPPER CO.**IDAHO.**

Office: 20 Broad St., New York. Mine office: Decorah, Washington Co., Idaho. Property under \$250,000 bond to Col. Geo. W. E. Dorsey.

BLUE JACKET MINE.**IDAHO.**

Mine office: care of Frank E. Johnesse, operator under bond and lease, Grangeville, Idaho Co., Idaho. Lands, 4 unpatented claims, area 75 acres, showing 2 contact veins of great width, assaying 4% copper, 7 oz. silver and \$4 gold per ton. Ores are oxides near surface and sulphides at depth. Shafts, 100' to 300' deep, with 1,000' of underground openings. Has gasoline power.

BLUE JACKET MINES.**IDAHO.**

Office and mine: Decorah, Washington Co., Idaho. Col. Geo. W. E. Dorsey, manager; John C. Rogers, superintendent. Property, held under \$250,000 bond and lease from Blue Jacket Consolidated Copper Co., is 295 acres, opened by 250' shaft, which is said to have produced \$200,000 in copper, carload shipments having given smelter returns of 47% copper.

BLUE JAY MINE.**CALIFORNIA.**

Letter returned unclaimed from Redding, Shasta Co., Cal. Property is 4 miles north of Redding and 3 miles from Keswick, showing sulphide ores and a little native copper, in a 300' vein traceable 1,000' and opened by a shallow shaft.

BLUE JAY MINE.**NEVADA.**

Mine office: Yerington, Lyon Co., Nev. A. Pugh, superintendent. Opened by shaft and tunnel. Has steam power.

BLUE JAY GROUP.**UTAH.**

Office: care of John Skewes, owner, Salt Lake City, Utah. Lands are in vicinity of Moab, Grand Co., Utah. Main shaft, about 100', shows ore assaying up to 25% copper.

BLUE JAY MINING CO.**CALIFORNIA.**

Mine office: Letcher, Fresno Co., Cal. N. Phillips, superintendent, at last accounts.

BLUE LAKE GOLD & COPPER MINING,**WASHINGTON.****SMELTING & POWER CO.**

Office: 302 Wisconsin St., Milwaukee, Wis. Mine office: Conconully, Okanogan Co., Wash. C. T. McElroy, secretary and general manager. Has 6 veins, of 1' to 3' width, giving assays of 3% to 49% copper and \$3 to \$11 gold per ton.

BLUE LEDGE COPPER CO.

Office: Prescott, Arizona. Organized 1904, with capitalization \$4,000,000.

BLUE LEDGE COPPER CO.**OREGON.**

Letter returned unclaimed from former mine office, Applegate, Jackson Co., Ore. Ores carry copper, gold and silver. Has steam power.

BLUE LEDGE MINE.**CALIFORNIA.**

Office: care of B. C. Kingsbery, Spokane, Wash. Lands, 13 claims, area 260 acres, at the head of Joe Creek, Siskiyou county, California, about 4

miles south of the Oregon line, carrying a 20' contact vein between white and black mica-schists, opened by 3 tunnels, longest 80', showing chalcopyrite and a little native copper, with average assay values of about 4% to 5% copper and 8 oz. silver per ton. Supposed to be under bond to Clark and Kingsbery, of Spokane, Wash.

BLUE RIDGE COPPER CO.

VIRGINIA.

Office: 613-145 La Salle St., Chicago, Ills. Mine office: Mauck, Madison Co., Va. Organized under laws of Virginia, with capitalization, \$500,000, shares \$5 par. Jacob Lauth, president; Frank L. Race, secretary and treasurer. Lands, circa 100 acres, on the eastern slope of the Blue Ridge Mountains, 10 miles from Norfolk & Western R. R., opened by old pits and a 60' shaft. Lode is said to be a contact vein between granite and metamorphosed slate, carrying malachite, azurite, cuprite and native copper.

BLUE RIDGE COPPER MINING CO.

NORTH CAROLINA.

Mine office: Gap Creek, Ashe Co., N. C. Property, 30 miles from nearest railroad, is said to show a 12" fissure vein carrying a considerable variety of auriferous copper ores.

BLUESTONE MINE.

NEVADA.

Mine office: Yerington, Lyon Co., Nev. Reported sold, 1904, to Capt. J. R. De La Mar, for \$125,000.

BLUE WING COPPER CO.

NORTH CAROLINA.

Succeeded by Boston & Carolina Copper Mining Co.

BLUE WING MINE.

NORTH CAROLINA.

Mine office: Baker City, Granville Co., N. C. Property was formerly held by the Blue Wing Copper Co., and later by the Boston & Carolina Copper Mining Co. Never successful, owing to bad management. Has several shafts, of 100' to 317' depth, with 4 levels opened on main shaft, these showing extensive bodies of disseminated bornite, with gangue of quartz and calcite. No stoping has been done below the 150' level. Idle.

GEWERKSCHAFT BOBERTHALER ERZBERGWERKE.

GERMANY.

Mine office: Kupferberg, Schlesien, Germany. Dr. Kossman, manager. Organized June, 1902. Production, 1902, was 80 metric tons refined copper. Employs 21 men.

BOBTAIL MINES CO.

ARIZONA.

Office: Minneapolis, Minn. Mine office: Globe, Gila Co., Ariz. F. D. Adams, superintendent, at last accounts. Lands, 20 claims, including the Little Wonder gold mine and the Bornite group carrying gold, silver and copper. Has steam power and 4 stamp mill, employing 15 to 20 men.

BOCCHEGIANO MINE.

ITALY.

Operated by Societe Anonima delle Miniere di Montecatini.

KÖNIGLICHE HÜTTENVERWALTUNG BODENMAIS.

GERMANY.

Mine office: Bodenmais, Bavaria, Germany. Ores are iron and copper pyrites, and products are blue vitriol and copperas. Employs 80 men.

BOGOSLOVSKI MINES.

RUSSIA.

Office: care of Baron K M Keldt Von Turgensburg, Perm, Russia. Mine office: Bogoslovsk, Perm, Russia. Property includes 3 mines and

is one of the largest copper producers of the empire. Ores occur generally in contact veins between limestone and intrusive igneous rocks, and include oxides, carbonate, chrysocolla, etc., in the surface zone, with chalcopyrite and bornite in the zone of secondary enrichment, and chalcopyrite in association with iron pyrites and magnetite, with calcareous and quartz gangue, at depth. Has a smelter at Bogoslovsk, near the mines, and produces blister copper. Latest reported production was 2,634,767 lbs. refined copper in 1899.

BOHEMIAN RANGE COPPER CO.**MICHIGAN.**

Office: care of Mathew Van Orden, treasurer; Houghton, Mich.; Thomas O. Bennetts, superintendent. Is a syndicate, formed to explore a tract of 960 acres lying about $3\frac{1}{2}$ miles east of the Mistwabik. Surface trenching showed several amygdaloid beds, upon one of which a shaft was started late in 1904. Employs about 20 men and has good copper at bottom of a 60' shaft.

BOLAÑOS MINING CO.**MEXICO.**

Office: St. Louis, Mo. Mine office, Bolaños, Jalisco, Mex. W. C. Stith, president, C. W. Simmons, treasurer; Juan B. Izabel, general manager. Company succeeds the bankrupt Bolaños Mining & Milling Co. Property formerly was worked by an English company. Present owners plan erection of a 150-ton mill.

COMPAGNIE DU BOLEO.**MEXICO.**

Offices: 56, Rue de Provence, Paris, France. American office: 614 Sansome St., San Francisco, Cal. Mine office: Santa Rosalia, Baja California, Mex. Employs 1,600 men. E. Puerari, chairman; P. Miribaud, adminstrateur-delegate; Ch. LaForgue, director-general; M. Demarest, secretary; W. W. Rose, general mine superintendent. Organized 1885, under laws of France, with capitalization 12,000,000 francs; debentures, 1,782,000 francs, in bonds of 500f., bearing 4.5% interest. Profits of company in 1902 were 1,750,961.08 francs, an increase of 544,705.48 francs over 1901 and for 1903 were 5,829,449 francs, from which a dividend of 2,500,000 francs was paid. Dividends for 1901 and 1902 were 62 francs 50 centimes for each year. Company is supposed to be controlled by the French house of Rothschild. Enjoys, for a period of 20 years, ending Dec. 17, 1912, exemption from all federal and local taxes except stamp taxes; exemption of employes from military and civil service, and exemption from customs, duties and local dues, and for a term of 50 years, expiring 1942, is exempt from export duties on copper produced and import duties on fuel consumed. In addition to its own mines the Compagnie du Boleo owns a considerable proportion of the stock issue of the Compagnie D'Inguaran.

Mineral lands are 11 groups, including 3 principal groups of mines known as the Soledad, Providencia and Purgatorio, also a promising new mine, known as La Bricas, and 11,920 hectares of grazing lands, south of the mines. The ore occurs in a formation of Tertiary conglomerates, sandstones and tufas, traversed at certain points by trachyte, the cupriferous tufas overlying conglomerates of eruptive rock pebbles, and being surmounted by argillaceous tufas, all traversed by fissures. The ores are of great variety,

including cuprite, melaconite, azurite, malachite, crednerite, chrysocolla, atacamite, covellite and chalcocite. There are three cupriferous beds, of which the upper averages about 3' in thickness, the middle 2' to 3', and the bottom bed 2' to 10'. The middle bed carries oxide and carbonate ores in colitic concretions, known locally as boleas, hence the name of the mine. The lowest bed is partly below the water line and carries sulphide ores, as well as oxides and carbonates. The ore is disseminated through the tufas in thin, irregular veins with clay gouge, and has a marked concentration toward the bottom of each bed, where the ore forms compact layers of 6" to 12". The main workings are 15 metres to 200 metres above sea level, the mine being opened by numerous tunnels, and by 7 shafts of the following depths: Sombrero, 98 metres; Carmen, 53m.; Purgatorio, 55m.; Central, 156m.; Amelia, 48m.; Santa Rita, 86m.; San Juan, 86m. The mine is extensively developed, having about 125,000 metres of underground openings in service.

The mine has complete steam and electric plants, generating about 2,000-h. p. from steam engines, of which 1,500-h. p. is transformed by three-phase dynamos for distribution to the various mines, and for the electric locomotives used. Owing to the peculiar nature of the mine all drilling is done by hand, and the richness of the ore is such that no mechanical concentration is attempted, hand-sorting being deemed sufficient. The smelting plant was rebuilt in 1901 and has eight 150-ton water-jacket furnaces. The ore is smelted to a matte of 58% to 65% tenor, and about one-third of the matte is reduced to black copper of 89% to 94% in tenor, both matte and bars being shipped to Falmouth, England, for refining. German coal is used for smelting and coal briquettes for general fuel. The average net copper return of ore smelted was 4.29% in 1900, 3.95% in 1901 and 4.38% in 1902. Ore is hand-sorted and machine-briquetted, at a cost of only one franc per ton, the argillaceous gangue serving as a natural binder.

The climate is tropical and the country extremely arid. Potable water is secured by a pipe-line of 16,074 metres from a reservoir on the Yaqui plateau, with pumps at Santa Aguede and Santa Rita. There is also a condensing plant, with 4 powerful pumps, for the distillation of sea water. A private railroad of 30 kilometres connects the mines with the smelter at Santa Rosalia, the road having 9 locomotives and 120 cars. At the port of Santa Rosalia, opposite Guaymas, Sonora, is a town of 7,000 people, dependent solely on the mines and smelter. The company has a 340-metre jetty, and owns a sailing vessel of 350 tons register. Miscellaneous enterprises include several general stores, a sawmill, four schools and a hospital. Wages are \$1.25 per day, Mexican, for common labor, with free water and medical attendance, but owing to much higher wages being paid on the mainland, across the Gulf of California, the Boleo is suffering from a scarcity of labor, and is working only 1,600 men, when 3,000 could be employed to advantage. A large number of Chinese coolies were employed, in 1903-1904, but only a few remained at the mines. Of 500 Japanese imported in 1904, only 40 remained at the mine at the close of the year. The production of

refined copper in 1902, was 10,953 metric tons, made from 249,895 tons of ore, and for 1903 the production of refined copper was 10,480 metric tons, a decrease of 373 tons. Ore mined in 1903 was 230,490 metric tons, with average recovery of 4.56% copper, an increase of 0.18% over the preceeding year. Production of 1904 was 11,121 metric tons of fine copper. The Boleo is a very valuable mine, and well managed, good results being secured notwithstanding the many serious drawbacks found in operation.

BOLINAS COPPER MINING CO.**CALIFORNIA.**

Office: 253 Spear St., San Francisco, Cal. T. P. H. Whitelaw, president and manager. Owns copper property showing 9 veins, 6" to 2' wide, in serpentine, 4 miles northeast of Bolinas Bay, Marin Co., Cal., on which considerable development work has been done. Ore on the dumps is said to carry 5% to 10% copper. Has a good equipment, including concentrator. Idle at last accounts and company refuses to furnish any statement.

BOLIVIAN COMPANY.**BOLIVIA.**

Organized, circa 1901, by Sir Martin Conway. Holds an important mining concession of 10,000 square miles, between the Andes and headwaters of the Amazon from the Bolivian government, on the basis of a royalty of one-third of net profits.

BOMPA SYNDICATE.**AUSTRALIA.**

Is developing a copper property at Glasford Creek, Gladstone district, Queensland, Australia. Showing said to be promising, but district lacks railway connections, which must be had before successful mining can be done upon any considerable scale.

BONANZA COPPER CO.**NEW MEXICO.**

Mine office: Las Vegas, San Miguel Co., N. M. Chas. N. Petteys, president and manager; Geo. H. Hunter, secretary. Has steam power, crushing mill and 25-ton leaching plant.

BONANZA MINING CO.**BRITISH COLUMBIA.**

Letter returned unclaimed from former office, Fort Simpson, B. C. Lands are in the Cassiar district. Idle.

BONANZA MINING CO.**WASHINGTON.**

Letter returned unclaimed from Index, Snohomish Co., Wash.

BONANZA MINING & SMELTING CO.**WASHINGTON.**

Office: 81 Sullivan Bldg., Seattle, Wash. Lands are the Edison group of 12 claims, in the Silver Creek district of Snohomish Co., Wash., opened by tunnels, with about one-half mile of underground development, showing auriferous copper ore.

BONANZA MOUNTAIN GOLD MINING CO., LTD.**BRITISH COLUMBIA.**

Mine office: Grand Forks, B. C. F. H. Knight, superintendent. Has low-grade auriferous and argentiferous copper ores.

BONANZA QUEEN MINING CO., LTD.**WASHINGTON.**

Office: Minneapolis, Minn. Mine office: Silverton, Snohomish Co., Wash. Richard H. Harehold, superintendent. Lands, 8 claims, showing 4 veins carrying auriferous copper ores. Has about 1,200' of underground openings and employed about 20 men at last accounts.

BONNER MINE.**ONTARIO.**

A group of claims on Michipicoten Island, Algoma, Ontario.

BONNY BELLE MINING & MILLING CO.**WYOMING.**

Said to have had 2 claims near the Ferris-Haggarty mine, in the Encampment district of Wyoming. Company moved office from 100 Washington St., Chicago, Ill., and left no forwarding address.

BOODLE MINING SYNDICATE, LTD.**COLORADO.**

Offices: 46, St. Mary Axe, London, E. C., Eng. Mine office: Central City, Gilpin Co., Colo. John Peter Reid, chairman; Chas. Pearson, secretary; W. J. Richards, superintendent. Capital, nominal, £15,000; issued, 7,500 shares, 15s. called up. Ores carry gold, silver and copper. Idle.

BORNITE COPPER & GOLD MINING CO.**ARIZONA.**

Letter returned unclaimed from former office, 16 State St., Boston, Mass. F. Rockwood Hall, president; Geo. D. Coleman, secretary and treasurer; W. G. Gates, superintendent. Lands are on Cram Mountain, Maricopa county, Arizona. Property is idle and the company makes no attempt to pay its bills.

BORNITE COPPER & GOLD MINING CO.**WASHINGTON.**

Office: care of C. W. Coffin, president, Banger, Me. Mine office: Darrington, Snohomish Co., Wash.; Wilbur E. Frank, secretary; C. G. Austin, general manager. Lands, 11 claims, in the Stillaguamish district. Showing large and promising outcrops of auriferous and argentiferous bornite and chalcopyrite. Development is proceeding by tunnel, and a power plant is being installed. Management seems vigorous and honest.

BOSSMO KISGRUBER.**NORWAY.**

Mine office: Bossmo in Ranen, Norway. Works ores carrying 0.5% and upwards in copper, and up to 50% sulphur, latter element furnishing the principal values of the ores. Production in 1902 was about 24,000 tons of cupriferous pyrites.

BOSTON CONSOLIDATED COPPER & GOLD MINING CO., LTD.**UTAH.**

Offices: 3, Great Winchester St., London, E. C., Eng., 146 Devonshire St., Boston, Mass., and 608 Dooly Blk., Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. Employs 75 men. John E. Dudley Ryder, chairman; E. E. Abercrombie, vice-chairman; Frank A. Schirmer, secretary and treasurer; L. Hanchett, general manager; Louis S. Cates, superintendent; Samuel Newhouse, managing director, under six-year contract, or until the mines are on a productive basis, he to then receive a percentage of the net profits. Mr. Newhouse has tendered his resignation, to take effect April 15, 1905. Organized May 14, 1898, with capitalization £500,000, shares £1 par. Although a British corporation, control is now held in the United States and reorganization under an American charter, while not yet suggested, is quite certain to come. Lands, 51 claims, area 349 acres, mainly adjoining the Highland Boy mine of the Utah Consolidated, in the Bingham or West Mountain district, title being held through an American corporation.

Country rocks are limestone and quartzite and ores are exclusively

sulphide, mainly bornite and chalcopyrite, averaging about 3.25% copper, 3 oz. silver and \$2 gold per ton. Development is by 5 tunnels, of 500' to 2,100' length each, with a total of about 5 miles of underground openings, exposing about 2,000,000 tons of ore. While the ore averages but little better than 3%, there are considerable quantities of high-grade ore, running up to 10% in tenor, with small quantities even richer. Principal tunnels are the Work, Peabody and Armstrong No. 1, latter having an electric haulage plant, connecting at the mouth of the tunnel, with the Copper Belt railway, which makes a rate of 15 cents per ton to the smelter, at Murray. Equipment includes a good steam plant, 10-drill Rand air compressor, 10 power drills, etc.

Production in 1904 was 47,846 tons, ore being sent to the Bingham smelter under 2 year contract, calling for 200 tons daily, of ore not under 3% copper, with a bonus of 10 cents per unit for excess of iron over silica. Ore produced was mined at an average cost of \$2.03 per ton, with gross costs of \$2.82 per ton. Production of 1904 was 3,223,836 lbs. refined copper. Shipments were suspended Oct. 1, owing to difficulty in keeping ore above 3% in large shipments, and contract has been modified to permit shipment of mine-run ore.

In addition to its developed mine, the Boston Consolidated has about 150 acres carrying simply enormous quantities of low-grade sulphide ores disseminated in porphyry. The Utah Copper Co. seems to be making a success of working precisely similar and adjoining ore, and the Boston Consolidated plans to follow suit. A 117-acre smelter site, with ample water supply, adjoining the Utah Consolidated smelter, is held under option, and it is planned to build a 500-ton concentrator thereon at a cost of about \$125,000. The Utah Copper Co. is said to be earning about \$1 net per ton from porphyry-sulphides averaging under 2% copper per ton. The building of a smelter also may be given consideration a little later.

The Boston Consolidated is a fine property, of great possibilities, and is well managed.

BOSTON GROUP.

NEVADA.

Near Reno, Fremont Co., Nev. Area, 110 acres. Under bond to J. K. Miller, et al., Colorado Springs, Colo., at last accounts.

BOSTON-ARIZONA MINING CO.

ARIZONA.

Office: 46 Broadway, New York. Mine office: Morristown, Maricopa Co., Ariz. Employs 4 men. Organized 1901, under laws of Arizona, with capitalization \$5,000,000, since reduced to \$500,000, shares \$1 par. Henry Livingston Bowdoin, president; T. J. Smith, secretary; W. T. Smith, treasurer and general manager. Lands, 10 claims, area 200 acres, in the Vulture district, showing 6 fissure veins, of which two average 4' to 20' width, opened by 3 shafts of 20' to 50' and an 80' tunnel, showing oxide and carbonate ores and giving assays of 1% to 40% copper and \$1 to \$22 gold per ton, with a little silver and galena.

BOSTON & ARIZONA CONSOLIDATED COPPER CO.

ARIZONA.

Letter returned unclaimed from former office, 501-7 Water St., Boston, Mass.

BOSTON & BRITISH COLUMBIA COPPER CO. BRITISH COLUMBIA.

Lost title to property. Company probably dead.

BOSTON & BRITISH COLUMBIA MINING CO. BRITISH COLUMBIA.

Office: 39 Cortlandt St., New York.

BOSTON & BUTTE MINE. ARIZONA.

Letter returned unclaimed from former mine office, Gilbert, Yavapai Co., Ariz. W. H. Burrage, superintendent, at last accounts. A prospect on which a limited amount of work has been done.

BOSTON & CAROLINA COPPER MINING CO. NORTH CAROLINA.

Mine idle and affairs tied up by litigation. Property was the Blue Wing mine.

BOSTON CLIMAX GOLD-COPPER MINING & INVESTMENT CO. WASHINGTON.

Office: Union Trust Bldg., Providence, R. I. Benj. F. Harrington, president and general manager. Lands are about 240 acres in Stevens Co., Wash., on which about \$25,000 has been spent in development work. Company gives no returns, but Mr. Harrington is a man of good standing. Property probably idle.

BOSTON-COLBY MINING CO. MONTANA.

Office and mine: care of Joseph Spikerman, Saltese, Missoula Co., Mont. Organized September 16, 1903, with capitalization \$1,000,000, shares \$1 par. Lands, 7 claims in the St. Regis section of the Cœur d'Alene district of Idaho and Montana.

BOSTON-COLORADO COPPER MINING CO. COLORADO.

Office: 50 White St., New York. Mine office: Fort Collins, Larimer Co., Colo. Edwin M. Keiser, president; Sanford Stark, vice-president and general manager; Roger C. Turner, secretary. Employs 5 to 10 men. Organized 1899, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Lands, 7 patented claims, area 63 acres, in the Howes Gulch district, showing carbonate and sulphide ores giving assays of 7% to 8% copper, 1 oz. silver and \$2.60 gold per ton, developed by shafts of 40' and 240' and two 200' tunnels. Has steam power and necessary mine buildings.

BOSTON & COLORADO SMELTING CO. COLORADO.

Office and works: Boston Bldg., Denver, Colo. C. C. Converse, president; Geo. D. Edmunds, secretary; Harold V. Pearce, manager. Has an extensive smelting plant and refinery, equipped with steam and electric power and employing about 200 men. Paid 10% dividends until 1898, and thereafter 6% dividends until 1903, when dividend was passed.

BOSTON & DENVER CONSOLIDATED MINING & MILLING CO. COLORADO.

Mine office: Black Hawk, Gilpin Co., Colo.

BOSTON GOLD-COPPER MINING CO. COLORADO.

A dubious concern, reorganized as Growler Copper Co.

BOSTON GOLD-COPPER SMELTING CO. COLORADO.

The smelter of this company, at Leadville, Colo., is under lease for a term of 10 years to the Republic Smelting Co.

BOSTON-IDAHO MINING CO.**IDAHO.**

Offices: 306-147 Milk St., Boston, Mass., and 6 First Natl. Bank Bldg., Ogden, Utah. Mine office: Nicholia, Lemhi Co., Idaho. Organized February, 1902, under laws of Utah, with capitalization \$500,000, shares \$1 par. R. P. Hunter, president and treasurer; Frank H. Clayton, vice-president and eastern manager; Ernest J. Waugh, secretary; O. A. Kennedy, superintendent. Lands, 8 claims, area 100 acres, in the Spring Mountain district, developed by about 1,500' of underground openings, giving ores assaying from a trace to 27.5% copper, 1 oz. to 40 oz. silver, from a trace to 57% lead and from a trace to \$1.60 gold per ton. Idle at last accounts.

BOSTON & LAKE SUPERIOR COPPER MINING CO.**ONTARIO.**

Office: 31 State St., Boston, Mass. Lands, if any, on northern shore of Lake Superior, in Canada.

BOSTON & MONTANA COPPER & SILVER MINING CO.**MONTANA.**

Office: 52 Broadway, New York. Mine office: Butte, Silver Bow Co., Mont. Smelter office: Great Falls, Cascade Co., Mont. Organized 1887, under laws of Montana, with capitalization \$3,750,000, in 150,000 shares of \$25 par value, full paid and non-assessable. Debentures; authorized and issued, \$1,000,000 first issue; \$500,000 second issue; \$600,000 third issue. Outstanding, January 1, 1904, \$400,000 at 7%. Paid dividends of \$5,250,000 in 1901, \$900,000 in 1902, \$1,200,000 in 1903 and \$9,600,000 in 1904. Total dividends to January 1, 1905, \$37,925,000. Practically the entire stock issue is owned by the Amalgamated Copper Co. Mines and smelter employ about 4,000 men. Sidney Chase, president; John D. Ryan, managing director; F. P. Addicks, secretary and treasurer; Sidney Chase, F. P. Addicks, Frank Klepetko, David Hennessey and James Phillips, Jr., directors; C. W. Goodale, general manager; D. W. Brunton, consulting engineer; J. C. Adams, mine superintendent; A. E. Wheeler, smelter superintendent.

The following table gives a summary of operations and results for the last two fiscal years ending June 1

	1903	1904
Tons of ore extracted.....	907,227	988,866
Gross yield per ton.....\$	14.03	\$ 12.86
Cost of mining	2,368,982.25	2,921,952.00
Cost of mining per ton.....	2.16	2.90
Cost of transportation	907,227.00	988,886.00
Cost of transportation per ton.....	1.00	1.00
Cost of reduction	2,767,042.00	2,501,830.98
Cost of reduction per ton.....	3.05	2.53
Paid for labor	2,824,814.00	2,921,952.00
Paid for machinery and supplies.....	2,311,211.00	2,439,428.00
Paid for marketing, refining and selling.....	2,634,180.00	1,795,538.00
Gross proceeds	12,730,899.00	12,720,282.00
Total expenditures.....	8,677,432.00	8,145,784.00
Net proceeds.....	4,053,467.00	4,574,498.00

Mineral lands are extensive, including in addition to the working mines

a large number of fractional claims, and part interests in various full and tractional claims. In addition to mining lands at Butte, and smelter-site at Great Falls, the company owns coal mines near Sand Coulee, 16 miles from Great Falls. The ore bodies of the Boston & Montana are the richest and the mine is the best in the Butte district. The ores are notably rich in silver and gold, returning an average of 0.025 oz. silver, valued at $1\frac{3}{4}$ cents, with silver at 55c per oz. and $\frac{1}{4}$ cent in gold, for each pound of copper produced. The mine has been opened to a depth of 1,851', showing excellent ore on the bottom levels, and it is altogether probable that values will hold to great depth. Frank Klepetko, formerly general manager, advised in 1901 that hoists good for a depth of 3,500' be installed. The ore mined gives average returns of a little under 5% copper and \$1.50 to \$1.75 per ton (averaging about \$1.62 per ton), in gold and silver values. The principal mines of the company are the Mountain View, Pennsylvania, Leonard, East Colusa, West Colusa Comanche and Moose, the latter a comparatively new property, also the Badger, which is leased, and shafts 4 and 5 on the Meaderville Flat. The Mountain View has a 3-compartment shaft, 1,851' deep, with 15 exits and connections, and on surface has a 115' steel gallows frame and an 18x48" Allis hoist, operating 2 double-deck cages, also an Allis air compressor with 20x42" steam cylinders and 22x42" air cylinders. It is intended to give the Mountain View a plant good for 3,000' depth. The Pennsylvania has a 3-compartment shaft, 1,561' deep, connected underground with the Mountain View, St. Lawrence and Silver Bow No. 1. Plant includes a 19x48" Allis hoist, operating 2 double-deck cages, and an Ingersoll-Sergeant air compressor with 20x30" steam cylinders and 24 $\frac{1}{2}$ x30" air cylinders. The Leonard has a 3-compartment shaft, 1,129' in depth, with a 19x48" Allis hoist, operating 2 double-deck cages, and compound Nordberg compressors with steam cylinders of 15", 28", and 42", and air cylinders of 19", 27", 29" and 42", also a duplex Risdon compressor with steam cylinders of 14", 26" and 30" and air cylinders of 14" and 30". The Leonard has shown a marked increase in gold values of late.

The West Colusa has a 3-compartment shaft, 1,442' in depth, with 7 exits and connections, timbered with 10x10" and 12x12" square sets, with a 60' steel gallows-frame and a 20x60" Nordberg hoist operating 2 single-deck cages. The East Colusa has a 3-compartment shaft, 900' deep, with 4 exits and a 16x32" Griffith & Wedge hoist. The Moose is a comparatively new property, with a 400' shaft only. In addition to the hoists, there are 12x14" Risdon sinking engines at the Mountain View, Pennsylvania, and Leonard, and a 13x12" Iron Bay hoist at the West Colusa. About 135 power drills are operated. The ore bodies of the various Boston & Mountain mines are very extensive, and reserves of smelting grade ore alone are estimated at about 3,000,000 tons. The mine has some stopes nearly 200' wide, carrying high-grade ore, and is opened for several years ahead of any possible productive requirements. The ores of the various mines show decreased values at depth, like all other mines, and a gradual decline in values may be anticipated henceforth, but shareholders need have no fear of the mine's future for many

years to come. About 15% of the mine's product is smelting ore, and 85% is concentrating ore. In addition to the mines heretofore enumerated, the Minnie Healey property is claimed by the Boston & Montana, this mine being in litigation.

Steam power is used exclusively at the mine. The water from the Mountain View and East and West Colusa mines drains to the 1,200' level of the Leonard and is forked thence by a duplex station-pump with Nordberg steam-end 20"x40"x42" with 7¼"x42" plungers. The steam-end is fitted with Corliiss valve and carries a fly wheel. The water-end was made by the company and cast in the Silver Bow foundry, at Butte. Valves are of the pot form and the entire water end is phosphor-bronze, and columns are lined with wood, thoroughly soaked with oil and coated on the inside with hot tar, to withstand the corrosive action of the mine water. Ultimately all of the company's mines will be unwatered from this plant, which is capable of raising 1,000 gallons per minute against a head of 1,200'. The mine water, which carries considerable copper in solution, is leached on reaching surface, the copper being precipitated on scrap-iron and product turned into bluestone.

The concentrator and smelter are at Great Falls, 171 miles from the mine, with a freight charge of \$1 per ton on ore, the high freight rate being offset by the advantage of the water-power developed at Great Falls. The concentrator is second only in size to the monstrous Washoe plant of the Anaconda, and is in 6 sections, each a complete mill in itself, the six having a total capacity of 2,700 tons daily. The building is of wood and is equipped with six 10x20" and twelve 5x12" Blake jaw crushers, 15 Huntington mills, 18 rolls, 68 Hartz jigs, 249 Evans jigs, 5 Overstrom concentrators, 6 Wilfley concentrators 10 six-foot vanners, 54 four-foot vanners and 30 slime tables.

The smelter treats 300 to 400 tons of high grade ore and the mill-product of about 2,700 tons of concentrating ore daily. The plant has 22 McDougal calciners, five 500-ton water-jacket blast furnaces, five 175-ton reverberatory furnaces and 12 converters of the upright type, each 14'2"x7' outside dimensions. Product is blister copper of 99% tenor, carrying 40 oz. silver and 0.25 oz. gold per ton. In connection with the smelter there is a very large electrolytic refinery having a daily capacity of 70 tons of refined copper cathodes, the gold and silver slimes being reduced and parted in a refinery at the plant. The electrolytic plant also has 3 furnaces for melting cathodes for casting the refined copper into wire-bars, cakes and ignots. The electrolytic copper from this plant is very pure and ranks high in the market. A portion of the blister copper from the smelter is sent to the Raritan copper works at Perth Amboy, N. J., and the plant also does a very limited amount of custom smelting. Current for the electrolytic plant is carried by solid overlapping slabs of copper. The management is said to plan increasing the present capacity of the Great Falls reduction plant by 20% to 25% in the near future.

Power for the concentrator, smelter and electrolytic refinery is secured from the Black Eagle Falls of the Missouri river, these having a 42' effective head, and generating 8,700 h. p., except at the lowest stages of water. The

auxiliary steam plant has 2,400 h. p. in Stirling water-tube boilers, and can supply power for the concentrator, blast furnace blowers, electric motors and cranes, in periods of low water.

The Boston and Montana is engaged in unending and apparently unendable litigation with the subsidiary companies of the United Copper Co. Several years ago the company was reincorporated under laws of New York, but an attempt to turn over the assets of the Montana corporation was met with local injunctions, whereupon the New York corporation was dissolved. The Boston & Montana, by reason of sundry injunctions, was restrained, until late in 1904, from paying dividends on shares owned by the Amalgamated Copper Co., which is practically the sole owner of the Boston & Montana. Production of refined copper is not stated by the company, but for the year ending June 1, 1903, was approximately 90,750,000 lbs., produced at a net cost of 9.56c per pound, including gold and silver values, or at a cost of 11.18c per pound, exclusive of gold and silver values, which amount to about $1\frac{1}{2}$ cents per pound, and for the calendar year, 1904 was approximately 94,000,000 lbs., at a slightly lower net cost.

The Boston & Montana now has, and for many years has had, a most excellent local management. It was the world's largest copper producer in 1904, but will have several vigorous young rivals for first place in the near future.

BOSTON & NEVADA MINING CO.

NEVADA.

Letter returned unclaimed from former mine office, Yerington, Lyon Co., Nev.

BOSTON & NEW MEXICO COPPER CO.

NEW MEXICO.

Office: 502 Colonial Bldg., Boston, Mass. Organized April, 1903, under laws of South Dakota, with capitalization \$200,000. John E. Kimball, president; Andrew Swanson, treasurer; C. J. Arthur, secretary and manager. Advertises asking the public to "write for prospectus," but sedulously refrained from sending same to the Copper Handbook, when requested. Has stock to sell, of course, but is a rather dubious-looking proposition, considered by and large.

BOSTON & ST. MARY COPPER MINING CO.

MONTANA.

Office: presumably Great Falls, Mont. Location of lands unknown, but probably in Montana.

**BOSTON-ST. PAUL CONSOLIDATED
COPPER MINING CO.**

WASHINGTON.

Office: 712 St. Peter St., St. Paul, Minn. Mine office: Index, Snohomish Co., Wash. Capitalization \$2,000,000, shares \$1 par. Wm. H. Baker, president; O. S. Derringer, secretary. Lands, 8 claims, adjoining the Ethel. Does merely assessment work.

BOSTON & SEATTLE MINING CO.

MONTANA.

Mine office: Elliston, Deer Lodge Co., Montana. Lands, 11 claims, 4 patented, about 12 miles from Elliston, said to show large bodies of low-grade ore, which can be worked advantageously only with railroad facilities,

now lacking, but hoped for. Company plans building a smelter when rail connection is secured.

BOSTON & SEVEN DEVILS COPPER CO.**IDAHO.**

Letter returned unclaimed from former office, 53 State St., Boston, Mass. Lands, near Cuprum, Washington Co., Idaho. Smelter was sold for debt, in 1903, and company seems hopelessly insolvent.

BOSTON-SIERRA MADRE MINE INDUSTRY CO.**COLORADO.**

Office: 118-59 Clark St., Chicago, Ills. Mine office: Slater, Routt Co., Colo. Employs 6 men. Amos Pettibone, president; Lewis A. Pease, secretary, treasurer and general manager; Ralph K. Cotton, superintendent. Organized 1900, under laws of Wyoming, with capitalization \$1,000,000, shares \$1 par. Lands, sundry claims, showing three fissure veins in andesite, carrying ores giving average assay values of 10% to 70% lead; 60% zinc; 8 oz. to 600 oz. silver; from a trace to 72 oz. gold and small percentages of copper. Has several shallow shafts and 160' main shaft, also a 336' tunnel, with about 1,000' of underground openings, estimated to show 7,000 tons of ore. Property is 45 miles from nearest railroad. Has water power available.

BOSTON & SILVERTON MINING & REDUCTION CO.**COLORADO.**

Mine office: Silverton, San Juan Co., Colo. A. A. Lamont, superintendent. Ores carry gold, silver, lead and copper. Has steam power and a 10-stamp mill, employing 20 to 30 men.

BOSTON TERRACE COPPER MINING CO.**UTAH.**

Office: 631-53 State St., Boston, Mass. H. T. Gerrish, treasurer. Capitalization, \$500,000, shares \$1 par; \$100,000 unissued. Lands, 11 claims, area 220 acres in the Newfoundland district of Box Elder county, Utah, showing about one-half mile of underground openings, including 10 shafts of 30' to 285' depth. Ores have assayed up to 27% copper, 19% lead, 86 oz. silver and \$1.20 gold per ton.

BOSTON & TEXAS COPPER CO.**TEXAS.**

Office: Tremont Bldg., Boston, Mass. Lands, near Spalding, Archer Co., Texas. Organized 1898, under laws of Arizona, with capitalization \$2,500,000, shares \$10 par. E. M. Low, president; Jas. M. Wheaton, secretary and treasurer. Idle for some years.

BOSTON & TEXAS COPPER MINING CO.**TEXAS.**

Promoted, in 1898, by Chas. Denison, Hartford Trust Bldg., Hartford, Conn. Was advertised as another Calumet & Hecla. Cannot be learned that any mining was attempted.

BOSTON & TINTIC MINING CO.**UTAH.**

Office: 401 D. F. Walker Bldg., Salt Lake City, Utah. Mine office: Silver City, Juab Co., Utah. Idle. Organized 1899, under laws of Utah, with capitalization \$500,000, shares \$1 par. Wm. H. Tibbals, president and general manager; E. J. Waugh, secretary; R. L. Lyman, treasurer. Lands, 3 patented claims, area 45 acres, in the Tintic district, opened by a 240' shaft and showing 2 fissure veins of 8" average width, 20' length and 200' depth, with estimated average values of 35% copper, 4% to 53% lead, 14 oz. to 120 oz. silver and 40 cents to \$2 gold per ton.

BOSTON & WYOMING COPPER-GOLD CO.**WYOMING.**

Office: Custer, Custer Co., S. D. Mine office: Wheatland, Laramie Co., Wyo. Employs 4 men. Organized October, 1903, under laws of South Dakota, with capitalization \$2,000,000, shares \$1 par. W. A. Nelson, president; John I. Hightower, vice-president and general manager; W. E. Benedict, secretary; Lands, 6 claims, area 120 acres, known as the Seldom Seen group, showing 3 fissure veins in granite-porphry, giving assays of 5% to 7% copper, 6 oz. silver and \$3 gold per ton, from cuprite, chalcocite, bornite and chalcopyrite, with sulphide ores predominating.

BOULDER COPPER MINING CO.**SOUTH DAKOTA.**

Office: P. O. Box 118, Custer, S. D. W. A. Nelson, president. Capitalization \$1,000,000, shares \$1 par. Lands, in Pennington county, South Dakota, are said to show gold and copper ores.

BOULDER MINING & MILLING CO., LTD.**IDAHO.**

Lands, sundry claims in the Alto district of Idaho, showing ores carrying gold, silver, lead and copper.

BOZEMAN COPPER CO.**MONTANA.**

Office: Bozeman, Montana. Organized August, 1904, with capitalization \$100,000.

BRADFORD COPPER MINING CO.**ARIZONA.**

Mine office: Patagonia, Santa Cruz Co., Ariz. W. E. Balcom, superintendent.

BRADFORD DEVELOPMENT CO.**ARIZONA.**

Office: 15 Stone Ave., Tucson, Ariz. Mine office: Vail, Pima Co., Ariz. F. L. Dwight, president and general manager; Stewart Bradford, secretary and treasurer; Wm. Schley, superintendent. Organized Oct. 4, 1903, under laws of Arizona, with capitalization \$50,000, shares \$10 par. Lands, 32 mineral claims, with total holdings of 1,000 acres, in the Helvetia and Empire districts, showing ore bodies in limestone near granite and schist contacts, carrying oxide, carbonate and sulphide ores giving assays up to 17% copper, 16 oz. silver, and \$10 gold per ton, opened by three 60' shafts and tunnels of 80', 100' and 125'. Company is composed of men of good standing, capitalization is reasonable, and the showing of mineral values secured is very fair for the limited amount of work done.

BRADSHAW MINING CO.**ARIZONA.**

Office: 327 New York Life Bldg., Chicago, Ill. Mine office: Briggs, Yavapai Co., Ariz. Organized 1904, under laws of Arizona, with capitalization \$2,000,000, shares \$1 par. Property is leased to North American Exploitation Co. Samuel B. Willey, president; Davis Ewing, secretary and treasurer; Frank T. Day, manager; E. W. Fisher, general superintendent; Wm. Roberts, superintendent. Lands, 23 claims, area 400 acres, also 40-acre millsite, in the Castle Creek district, showing contact veins of 30' to 100' width between granite and porphyry, carrying galena, malachite, melaconite and cuprite, giving assays of 15% copper, 20% to 40% lead, and \$6 to \$10 gold per ton, opened by shafts of 150' and 300' and tunnels of 150', 80' and 60', estimated to show 6,000 tons of ore, with 4,000 tons blocked out for stoping.

BRADSHAW MINING CO.**OREGON.**

The Blue Lead Copper mine in the Upper Applegate district of Josephine county, Oregon, is said to have been bought, 1904, by a New York mining company of this name.

BRADSHAW MOUNTAIN COPPER MINING & SMELTING CO.**ARIZONA.**

Office: 25 Broad St., New York. Mine office: Middleton, Yavapai Co., Ariz. Works office: Val Verde, Yavapai Co., Ariz. Organized under laws of Arizona, with capitalization \$10,000,000, shares \$10 par. Has authorized an issue of \$1,000,000 5-year 6% bonds. John R. Allen, president; Geo. W. Middleton, vice-president and manager; H. F. Good, treasurer; G. P. Humphrey, secretary; R. L. Clarke, mine superintendent; S. E. Bretherton, smelter superintendent; Geo. O. Marrs, engineer. Lands, 70 claims, 17 patented, area 1,400 acres, in the Bradshaw Mountains, 40 miles southeast of Prescott. Tract covers about 6½ miles of the strike of a very persistent copper formation, and lies about midway between Crown King and Mayer. Country rocks are porphyry and quartzite, showing five parallel veins of 10' to 60' width, carrying malachite, azurite, melaconite, cuprite, chalcopryrite, bornite and chalcocite, with schistose gangue, said to contain average values of \$12 to \$15 per ton in copper, gold and silver.

Development is by the Copper Link tunnel of 800', and the Hot Number tunnel of 2,400'. Latter is 400' vertically lower than former, cutting the ore body 1,374' below the crest of the mountain, and having a double tram-track, laid with 20-lb. steel rails. Mine has about 8,000' of underground openings, exposing a large amount of ore of medium grade. A 4,000' Bleichert aerial tramway of 2,000 tons daily capacity connects the mouth of the Hot Number tunnel with 2,000-ton ore bins at the railway station. Mine plant includes two 80-h. p. boilers, 6-drill air compressor, power drills and 9 miles of air and water-pipe lines.

The mine was connected with the old 250-ton smelter at Val Verde by rail. This smelter, fully described in Vol. IV., was doing remarkably good work under the capable management of Mr. Bretherton, until accidentally burned Sept. 20, 1904. The plant was insured for \$52,000, but its destruction proved a severe blow, from which the company has not yet recovered. A new smelter with two 250-ton furnaces has been planned, and one furnace is about ready for delivery, but the mine was closed down toward the end of 1904, and the company is said to be in poor shape financially. The management seems to have been honest, but depended largely upon the sale of stock, and the loss of the smelter proved a serious setback. The property is regarded as a valuable one, and it is to be hoped that the company will be able to pull itself together and resume operations.

BRAGANZA GOLD MINING CO.**ARIZONA.**

Mine office: Big Bug, Yavapai Co., Ariz. Property is the Henrietta mine, carrying gold-copper ores, having steam power and 10-stamp mill.

NEGOCIACION MINERA DE O. y T. BRANIFF y CA.**MEXICO.**

Office: Rosales 9, Mexico, D. F. Mine office: Cadereyta, Queretaro,

Mex. Ores carry silver, copper, lead and zinc. Has steam power and a 6-ton smelter, employing about 200 men.

BRAULIO MADRIGAL TUMBISCATA.

MEXICO.

Mine office: Apatzingan, Michoacan, Mexico. Has steam power equipment, and is opened by shaft and tunnel.

GEWERKSCHAFT GRUBE BRICCIUS-STOLLN.

GERMANY.

Mine office: Annaberg, Saxony, Germany. E. R. Poller, manager. Has argentiferous and zinciferous copper ores. Presumably idle.

GEWERKSCHAFT BRIGITTA ERZBERGWERK.

GERMANY.

Mine office: Sennheim, Elsass, Germany. Has lead, copper and zinc ores. Presumably idle.

BRINDLE PUP MINING CO.

ARIZONA.

Letter returned from former mine office, Dewey, Yavapai Co., Ariz.

BRISTOL MINE.

CONNECTICUT.

At Bristol, Hartford Co., Connecticut. Was worked during the last decade of the Nineteenth Century. Filled with water and mine machinery at bottom of shaft.

BRISTOL COPPER MINING CO.

NEVADA.

Office: 201 Mining Exchange Bldg., Denver, Colo. Mine office: Pioche, Lincoln Co., Nev. Capitalization \$2,000,000, shares \$1 par. Wm. Gelder, general manager; H. T. Freudenthal, superintendent. Ores carry copper, silver and lead. Is closely allied with the Hillside Copper Mining Company, in ownership and management. Has made very small shipments of ore, assaying 12% to 30% copper and about 10 oz. silver per ton. Property thought to be valuable, but company in financial straits.

BRITANNIA COPPER MINE, LTD.

Offices: 4, Bishopsgate St., London, E. C., Eng. W. E. LaMerton, secretary. Capital, nominal, £90,000; issued, £7,000. Location of lands, if any, not learned.

BRITANNIA COPPER SYNDICATE, LTD.

BRITISH COLUMBIA.

Office: P. O. Box 821, Vancouver, B. C. Mine office: Britannia Beach, B. C. Capitalization \$625,000, shares \$625 par. Edgar Dewdney, president; George H. Robinson, managing director; Wynn Meredith, consulting electrical engineer. Property is a group of 297 acres, lying 4 miles from; and about 3,500' above, salt water, at Howe Sound, Nanaimo Division, British Columbia, carrying approximately 8,500' of the strike of a mammoth mineral zone. This mineralized belt, ranging 300' to 600' in width, consists of a schistose silicious belt impregnated with iron and copper sulphides. Assays of 13 samples gave an average of 3.84% copper, 0.55 oz. silver and about 0.01 gold per ton. In actual operation the percentage of copper is likely to fall below these figures, but the ore body is of immense size, the amount of ore actually exposed having been variously estimated at 1,800,000 to 3,000,000 tons, with the certainty of far larger amounts at depth. The mine can be worked to advantage open-cast for many years, as the climate is not unsuited to winter work in the open.

A \$300,000 aerial tramway of 2,500 tons daily capacity is nearing com-

pletion and 500 h. p. has been developed from water under an effective head of 1,000'. Plant has Canadian Westinghouse 3-phase alternating current generators direct-connected with Pelton wheels. There is a 3-mile transmission of the electric current, with two 200-kw. 6,600-volt generators. At the bay is a 250' wharf with 90' L and a 300-ton concentrator is under construction. Company's plans call for an initial daily production of about 1,000 tons, and mine should become a producer quite early in 1905. Property is one of vast possibilities, and management is fully experienced and capable.

BRITANNIA MINING CO.**MONTANA.**

Office: 219 Germania Bldg., Milwaukee, Wis. Mine office: Butte, Silver Bow Co., Mont. G. R. Nickey, president and general manager; G. R. Best, secretary and treasurer; J. A. McLeod, superintendent; Wm. Fisher, engineer. Organized Sept. 25, 1892, under laws of Wisconsin, and capitalization increased Mar. 2, 1898, to \$350,000, shares \$1 par. Has paid dividends of \$42,000. Lands, one patented claim, area 13 acres, showing 6 veins, of which 3 parallel veins, of 3' to 30' width, are developed by shafts of 100', 150, and 400', with about 5,000' of underground openings, ores giving average values of about \$35 per ton, mainly in silver. Has steam power. Mine is leased by levels to different tributors, on royalty.

BRITISH AMERICAN GOLD COPPER CO.**SOUTH DAKOTA.**

Letter returned unclaimed from former office, Deadwood, S. D.

BRITISH COLUMBIA AGENCY, LTD.**BRITISH COLUMBIA.**

Mine office: Alberni, Vancouver Island, B. C. D. G. Smith, manager. Property includes the Modoc and Kitchener claims, which give a fair showing of chalcopryite and auriferous quartz.

BRITISH COLUMBIA CHARTERED CO.**BRITISH COLUMBIA.**

Office: Street Railway Chambers, Montreal, Quebec. Mine office: Summit, Yale & Cariboo district, B. C. Is commonly known as the B. C. mine. F. S. Parrish, manager. Lands, 8 full claims and 3 fractions, developed by about 7,000' of underground openings. Ores are argentiferous and slightly auriferous, averaging about 5.5% copper. Has a 225-h. p. steam plant, a 4-drill Rand and a 5-drill Ingersoll-Sergeant air compressors.

BRITISH COLUMBIA COPPER COMPANY, LTD. BRITISH COLUMBIA.

Office: 31 Nassau St., New York. Mine office: Greenwood, B. C. Organized 1898, under laws of West Virginia, with capitalization \$1,250,000, shares \$5 par. F. L. Underwood, president; F. L. Sommer, vice-president; R. H. Eggleston, secretary and treasurer; W. H. Thomas, managing director; Frederic Keffer, general manager; S. C. Holman, mine superintendent; J. E. McAllister, smelter superintendent. Lands, 10 crown-granted claims, area 180 acres, also a 60-acre millsite, in the Deadwood district, showing 5 ore bodies, of which 3 are being developed, one having a width of 80' to 150' and length of 1,300', opened to depth of 500' and returning an average of 1.7% copper, 0.4 oz. silver and \$1 to \$2 gold per ton. Country rocks are limestone and diabase, veins occurring as contacts and carrying auriferous and argentiferous chalcopryite in connection

with magnetite, calcite and silicious rocks. Has a 325' two-compartment main shaft with three other shafts of about 200' depth each. Has about 6,000' of underground openings, estimated to show about 6,000,000 tons of ore, with approximately 3,000,000 tons blocked out for stoping. Mine is operated by tunnels of 300', 600', 800' and 800', connected by upraises with the various quarries on the hill above. Main tunnel has a double track, with 3-ton cars, and at the mouth is a 24x36" Farrel crusher of 75 tons hourly capacity, reducing ore to size passing a 5" ring. The mine has a 500-h. p. steam equipment, including 2 hoists, one of 20x42", good for a depth of 1,000', a 10-drill straight-line cross-compound air compressor and a 35-drill cross-compound air-compressor, 25 power drills, Robins belt conveyors and Jeffrey bucket elevator.

The Snowshoe mine, bought 1904, is about a quarter mile from the Granby. Ore occurs as fissure replacements, ranging 25' to 200' in width, with an average width of about 100', and about 1,000' in proven length. Ore occurs as self-fluxing chalcopryite, occasionally in distinct bodies, but as a rule is disseminated in minute particles through a gangue ranging from silicious to calcareous, carrying occasional magnetite and specular hematite. The Snowshoe mine is opened by shafts of 200' and 300', and tunnels of 200', 250', and 600'. Main shaft with 3-compartments has a 150-h. p. double-drum electric hoist raising 2-ton skips. Bulk of ore is mined open-cast. Average cost of ore mined in 1903, under old company, was \$1.10 per ton. The British Columbia Copper Co., also owns a three-fourths interest in the Emma mine, and operates same.

The 750-ton smelter, at Greenwood, 2½ miles from the mine, does a general custom business. It has a 45x58' blast-furnace building, with two 375-ton Allis-Chalmers furnaces, 42x150" at the tuyeres, 2 Connorsville blowers, 150-h. p. Reynolds-Corliss engine, and 3 100-h. p. boilers, superseded by electric power, brought 25 miles from Cascade. Management plans installing 2 new 400-ton furnaces. The dust-flue chamber is 12x620', 14' high, leading to a 121' brick stack. Slag is handled in 5-ton side-dumping pots, hauled by a small steam locomotive. The 45x90' converter building, of steel, completed 1904, has two stands with five 5-ton shells, 84x126", of trough type, tilted by hydraulic accumulator, shells being handled by a 40-ton 4-motor electric traveling crane. Matte from the furnaces runs about 45% copper. The converter department has a 72" silica mill for linings. A briquetting plant is being installed for moulding the flue-dust. The reduction plant includes a 3-story 65x79' sampling mill and a 40x81' power-house.

The company employs about 100 men and 20% of the production secured is from custom ores. Ore production in 1904 was 211,864 tons, and net production was 5,081,743 lbs. refined copper, 118,418 oz. silver and 36,403 oz. gold. The property has a good management, and while low in grade and requiring careful handling, has an assured future if given proper care.

BRITISH COLUMBIA EXPLORATION, LTD.

BRITISH COLUMBIA.

Mine office: Kamloops, Yale & Cariboo district, B. C. J. Argall, general

manager. Property includes the Iron Mask mine and sundry claims at Kamloops, also the Colossus group at Estere Basin, Nanaimo district, where about 2,000' of development has been secured. The Iron Mask, opened 1899, has a 520' main shaft, with nearly a mile of underground development, opening a considerable body of auriferous copper ore, mainly of concentrating grade, with a fair proportion of smelting ore. Ore carries fair values in copper, silver and gold. Smelting ore and concentrates are shipped to the Granby smelter for reduction. Equipment includes a \$75,000 concentrator, built in 1904. Property is conservatively and capably handled.

BRITISH COLUMBIA & LAKE SHORE

BRITISH COLUMBIA.

COPPER CO., LTD.

Letter returned unclaimed from former mine office, Summit, B. C.

BRITISH EMPIRE GOLD, COPPER & DIAMOND SYNDICATE, LTD.

Apparently a dead one.

BRITISH GOLD & COPPER MINING CO.

SOUTH DAKOTA.

Said to have property in the Black Hills district, presumably in Pennington Co., South Dakota. Address of company not secured and no work known to be in progress.

BRITISH GOLD MINES OF MEXICO, LTD.

MEXICO.

Offices: Bush Lane House, Cannon St., London, E. C., Eng. Mine office: Torres, Sonora, Mex. Robt. J. Price, chairman; Geo. Thompson, secretary; John F. Allan, managing director in Mexico. Capitalization, £100,000; issued, £70,080. Lands include the Colorado Ures mine in Sonora, and a portion of El Carmen mine, Talpujahua, state of Michoacan. Has a 10-stamp mill and smelter at the Colorado Ures mine. Idle, and lands for sale.

BRITISH ORE CONCENTRATION SYNDICATE, LTD.

WALES.

Office: 1 St. Helen's Place, London, E. C., Eng. Mine office: Beddgelert, Wales. Organized, Dec. 21, 1900, with capitalization, £150,000, shares £1 par; issued, £85,007. Chas. N. L. Shaw, secretary. Property is the British rights to the Elmore oil concentration process and the Sygun, Cribb Dhu and Aran mines in North Wales, estimated to show ore reserves of 480,000 tons of gold-copper ores, equipped with 20-stamp mill and 4-unit Elmore oil concentrator, also an interest in a copper mine in Cornwall.

BRITISH SOUTH AFRICA COMPANY.

RHODESIA.

Offices: 2, London Wall Bldgs., London, E. C., Eng. This gigantic corporation owns sundry copper fields of promise in northern Rhodesia, which, as developed to the point of actual mining, are set aside as subsidiary corporations.

BRITTON GOLD MINING CO.

WASHINGTON.

Letter returned unclaimed from Whatcom, Wash.

K. K. BERG- UND HÜTTENVERWALTUNG BRIXLEGG.

AUSTRIA.

Mine office: Brixlegg, Tyrol, Austria. Is an active producer, securing considerable silver and a little gold as by-products. Gustav Kroupa, general manager; Vincens Svoboda, superintendent and mining engineer; Cayetan Hummel, smelter superintendent; Josef Link, purchasing agent. Mining

lands, about 22½ hectares. Ores are exclusively sulphide. Has a smelter at Brixlegg, this having blast, reverberatory, refining and anode furnaces and electrolytic plant. Annual production is about 225 metric tons of copper, 600 kilograms silver and 5 kilograms gold.

BROKEN HILL PROPRIETARY CO., LTD.

AUSTRALIA.

Offices: 320, Collins St., Melbourne, Victoria, Australia, and 3, Great Winchester St., London, E. C., Eng. Mine office: Broken Hill, N. S. W., Australia. Daniel W. H. Patterson, chairman Australian board; Frederick Dutton, chairman London board; G. D. Delprat, general manager; A. J. Harwood, mine manager; Francis M. Dickenson, secretary in Melbourne; R. J. Seeley, secretary in London; L. A. Williams, agent, Alfred Chambers, Adelaide, Australia; R. N. Kirk, agent, Sydney, N. S. W. Capitalization, £384,000, shares 8s. par. Has been a very large dividend-payer since 1891. Property is the Broken Hill silver-lead mine, sundry leases of iron ore lands for fluxes and lands at Port Pirie. Has steam and electric power, 2,000 ton concentrator and extensive leaching works at Port Pirie, employing about 2,500 men. Formerly produced copper matte carrying about 300 tons of refined copper yearly, but secretary states that under new metallurgical methods the copper is lost in saving the silver.

BROMIDE COPPER CO.

NEW MEXICO.

Supposed to have mineral lands near Tres Piedras, Taos Co., N. M.

BROMIDE COPPER & GOLD MINING CO.

NEW MEXICO.

Has 22 claims in the Bromide district, Rio Arriba, Co., N. M. Did considerable development work in 1902, but apparently idle since.

BRONZE MONARCH GROUP.

WASHINGTON.

Has a 300' tunnel, on claims adjoining the Sweden group near Mount St. Helens, Skamania county, Washington. Has produced about 1,000 tons of sulphide ore carrying gold, silver and copper.

BROOKLYN COPPER & GOLD MINING CO.

WASHINGTON.

Office: Auditorium Bldg., Spokane, Wash. Capitalization \$100,000. M. L. Pershell, president; C. von Gilsa, secretary. Lands are in the Colville Reserve, Washington. Declines to furnish any statement.

BROOKLYN MINING CO.

CALIFORNIA.

Mine office: Dale, San Bernardino Co., Cal. H. H. Ames, superintendent. Ores carry gold and copper. Has gasoline power and 3-stamp mill.

BROOKLYN MINING CO.

COLORADO.

Mine office: Silverton, San Juan Co., Colo. T. Manion, superintendent. Ores carry gold, silver and copper. Has steam power and 10-stamp mill.

BROOKLYN MINING CO.

NEVADA.

Mine office: Contact, Elko Co., Nev. Has gasoline power.

BROWN-ALASKA COPPER CO.

ALASKA.

Mine office: Coppermount, Prince of Wales Island, Alaska. Samuel Silverman, general manager; Paul Johnson, consulting engineer. Property includes the Mamie group and adjoining claims. Ore body on the Mamie is about 40' wide, giving average assays of 6% copper and \$1 gold and silver per ton. Ore is chiefly chalcopyrite, associated with pyrrhotite and pyrite.

Considerable mining development has been secured. The reduction plant includes a 60x80' sampler, 50' high; coke and coal sheds 100x140'; blast furnace building 60x70', of steel construction, with room for addition of converter plant; 40x50' boiler house; 45x50' engine house and 4 sets of ore bins, 60x120', with capacity of 10,000 tons, plant being so arranged that material can be handled automatically. The furnace is 44x160" at the tuyeres, with daily capacity of 400 tons, equipped with mechanical feeders. Slag will be handled by 2 locomotives, drawing 5-ton slag-cars. Coke will be brought from Ladysmith, B. C., at a cost of about \$6 per ton, delivered. Plant includes a 250-light electrical equipment. Contracts have been made with the Cracker Jack mine to furnish auriferous quartz for linings, and with the Mt. Andrews mine for a daily supply of 100 tons of copper ore. This is considered one of the most promising copper properties in Alaska.

BRUCE COPPER MINES, LTD.**ONTARIO.**

In voluntary liquidation. L. Abrahams, et al., liquidators, 31, Palmers-ton Bldgs., London, E. C., Eng. Property is the old Bruce Mines, on Georgian Bay, Algoma, Ont., opened in 1846, closed 1876, after producing \$3,300,000 worth of copper. Lands include mineral rights to 20 square miles. Depth, nearly 500'; ores, sulphide, mainly chalcopyrite in quartz gangue, occurring in several parallel veins traversing diabase and running nearly east and west. The two principal veins are 3' and 15' wide, giving ore said to average 5% copper. Plant includes rock crushers, rolls, jigs, hydraulic sizers, round tables, Griffin mill and Frue vanners. Concentrator said to have daily capacity of 400 tons. Property thought to be valuable, but cannot be worked to advantage without a smelter on the ground, or easily accessible.

BRUCE MINING CO.**IDAHO.**

Mine office: Junction, Lemhi Co., Idaho. A. T. Bruce, general manager. Employs 15 to 20 men. Has copper-gold ores, opened by tunnel, and contemplates installation of a small smelter.

BRUCE & CHESSOR MINING CO.**BOLIVIA.**

Mine office: Oruro, Bolivia. Has steam power and employs about 100 men.

BRUGER y CA.**BOLIVIA.**

Office and mine: Toledo, La Paz, Bolivia. Are small producers of copper and have steam power.

JOSÉ GONZALEZ BRUNO.**CHILE.**

Mine office: Cojon de Maipú Santiago, Chile. Mines have copper ores, carrying cobalt in connection. Properties have steam power and employ about 50 men.

BRUNSWICK CONSOLIDATED GOLD & COPPER MINING CO.**CALIFORNIA.**

Mine office: Grass Valley, Nevada Co., Cal. Is an old gold producer, recently rejuvenated, but cannot be learned that it has any copper property.

BRUNSWICK MINING CO.**COLORADO.**

Mine office: Tin Cup, Gunnison Co., Colo. Ores carry gold, silver and copper. Has steam power and 100-ton concentrator.

BUCHANAN MINE.**CALIFORNIA.**

Near the northern boundary of Madera county, California, a little south of the Green Mountain mine in Mariposa county, and 5 miles northeast of Daulton. Owned by G. A. Pherson. Opened by shafts and tunnels. Vein matter, diabase and amphibolite schist, both mineralized. Ores, oxides near surface, unaltered sulphides at depth. Shipments made by lessees average about 15% copper and \$3 gold per ton. Has been a considerable producer in the past.

BUCKEY GROUP.

Office: care of A. Chas. Smith, P. O. Box 312, Douglas, Ariz. Location of lands unknown.

BUCKEYE CONSOLIDATED GOLD & COPPER MINING CO.**NEW MEXICO.**

Former office: 414 Atlas Blk., Salt Lake City, Utah. Dead.

BUENA VISTA COPPER MINES, LTD.**MEXICO.**

Offices: 11, Queen Victoria St., London, E. C., Eng. S. Spencer, chairman; E. T. Stanton, secretary. Capital, nominal, £50,000. Lands, 45 acres, including the Buena Vista and San Bruno copper mines and the Aurora gold mine, near the Boleo mine, in Lower California, Mexico.

BUENA VISTA COPPER MINING CO.**ARIZONA.**

Mine office: Solomonville, Graham Co., Ariz. Has a 100' shaft, showing well in ore, and sent a sample shipment of 25% ore to the El Paso smelter in November, 1903.

BUENA VISTA COPPER MINING CO.**CALIFORNIA.**

Mine office: Valley Springs, Amador Co., Cal. Property includes the Bull Run and Russell mines, carrying sulphide copper ores in schistose diabase. Has steam power.

BUENA VISTA MINING & MILLING CO.**ARIZONA.**

Mine office: Washington, Santa Cruz Co., Ariz. F. Cox manager, at last accounts. Ores carry gold, silver and copper.

BUENOS AIRES MINING CO.**MEXICO.**

Mine office: Cusiuhirachic, Chihuahua, Mexico. W. C. Rollins, superintendent. Lands include La Lola and El Murillo mines, carrying ores of gold, silver and copper. Has gasoline power, concentrator and 40-ton smelter, employing about 50 men.

MINAS BUENOS AMIGOS y OTRAS.**MEXICO.**

Office: care of H. C. Harrison, owner, Apartado Postal, 64, Monterey, N. L., Mex. Mine office: Cerralvo, N. L., Mex. Are producers of silver, lead and copper, latter as a by-product, and employ about 100 men.

BUFA MINING, MILLING & SMELTING CO.**MEXICO.**

Mine office: 709 Lankershim Bldg., Los Angeles, Cal. Mine office: La Bufa, Sahuaripa, Sonora, Mex. Employs about 600 men in the dry season and 300 in the wet season. Organized 1902, under laws of Arizona, with capitalization \$1,500,000, shares \$1 par. Davis Richardson, president; Wm. E. Richardson, vice-president; Baron W. Riley, secretary; L. R. Richardson, treasurer; Frank Richardson, superintendent; Arthur A. Lane, mill

superintendent; P. Quinn, mine superintendent; Edwin M. Clark, engineer and metallurgist. Lands, 50 pertenencias, area 123 acres, also a 3-acre millsite and 5,000 acres of miscellaneous lands, showing 6 fissure veins, of which 2 are undergoing development, these averaging 4' width and opened to 600' on an incline, giving average assays of 12% copper, 10% lead and 325 oz. silver per ton, from argentiferous tetrahedrite and sulphide copper ores. Has 3 shafts, deepest 470', with 8,000' of underground openings and about 20,000 tons of high-grade ore blocked out for stoping. Has a complete steam power equipment, 25-ton concentrator, 10-ton leaching plant, 5-stamp mill, 2 roasting furnaces, and 35-ton smelter, with reverberatory furnace made of silica brick. Everything about the furnace, except the iron work was made on the ground. The success achieved by this smelter, is a high testimonial to the resourcefulness and ability of Mr. Clark, its designer. Company began payment of 2.5% semi-annual dividends, January, 1903. Production, 1904, was about 1,200,000 lbs. fine copper.

BUFFALO GROUP.

MONTANA.

Sundry claims in the Scratch Gravel district, northern Montana. Were taken under bond by Lake Superior mining men in 1902, but dropped later.

COMPANIA DEL FERROCARIL y MINAS DEL BUITRON.

SPAIN.

Mine office: Zalamea la Real, Huelva, Spain. Don Diego Bull, general manager. Company is controlled by F. C. Hills & Co., of London. Mines include the Castillo del Buitron and La Poderosa, area 6 hectares, at Zalamea, and the Concepcion mine, area 42 hectares, at Almonaster. Sundry other properties are under exploration. Annual production is estimated at about 1,500,000 lbs. of refined copper.

BULL DOMINGO MINING CO.

WYOMING.

Mine office: Hecla, Laramie Co., Wyo. John L. Morgan, superintendent, at last accounts. Ores carry copper and gold values.

BULLARD MINE.

ARIZONA.

Lands, 5 claims in Cunningham Pass, Yuma county, Arizona, said to give assays of 12% copper and \$12 gold per ton.

BULLION MINING CO., LTD.

IDAHO.

Office: Wallace, Idaho. Organized 1902, under laws of Idaho, with capitalization \$1,000,000, shares \$1 par. B. F. O'Neil, president; James H. Taylor, secretary; D. A. McKenzie, general manager. Lands, 4 claims, area 80 acres, showing a 12' fissure vein giving assays of 14% copper, \$4 gold and 12 oz. silver per ton, from sulphide ore. Shaft, 100'; tunnels, 80' and 170'.

BULLION BECK & CHAMPION MINING CO.

UTAH.

Mine office: Eureka, Juab Co., Utah. P. L. Farnsworth, manager. Secures a limited amount of copper as a by-product from gold-silver-lead-copper ores. Has steam and electric power and concentrator, employing about 150 men.

BULLWHACKER GOLD & COPPER CO.

ARIZONA.

Promoted by H. B. Clifford & Co., 10 Wall St., New York. Lands,

4 miles east of Prescott, Yavapai county, Arizona. Apparently a mere stock-jobbing scheme.

BULLY HILL COPPER MINING & SMELTING CO. CALIFORNIA.

Office: Salt Lake City, Utah. Mine office: Delamar, Shasta Co., Cal. Employs about 300 men. Organized under laws of New Jersey, with capitalization \$2,500,000, shares \$25 par. J. R. De La Mar, president; H. P. Parsons, treasurer; John B. Keating, superintendent. Lands, 18 patented claims, area 213 acres, in the Pittsburg district, 25 miles northeast of the Mountain Copper mine at Keswick, and in the same geological horizon. Also owns the Idaho, Iowa and Columbia claims, bought September, 1903, and has under bond the Copper City mine, opened by a 160' shaft showing high-grade ore. The Bully Hill was opened as a gold mine and worked the gossan with rather indifferent results until copper ores were developed at depth. Bully Hill, with a diameter of about 4,000' and rising 1,200' above the surrounding country, is composed of eruptive rocks, principally rhyolite, with 3 mineral zones having a strike of approximately north and south, the ore occurring in shear-zones in rhyolite and meta-diorite dykes, all of superficially slaty structure, the lenses having a clay gouge of 1' to 30' on one or both walls. The main lenses have stringers and feeders ranging from a few inches to 30' in width, carrying 2% to 30% copper. The principal lenses are 20' to 300' long, 2' to 40' wide and one has been opened to a depth of 672'. The zone of secondary enrichment shows about 10' of bonanza ore, the main ore bodies below carrying chalcocite associated with pyrite, also a little bornite and chalcocite, with occasional carbonate and oxide ores and native copper. The best ore body gives average assays of about 15% copper, 6 oz. silver, and \$8 gold per ton, and shows native copper and native silver in considerable quantities on the 670' level. Principal development is by 3 tunnels, giving a back of 350'. No. 2, the main working tunnel has double tracks, and an underground station 100' square, in No. 3 shaft, contains powerful hoisting and pumping machinery. The mine is timbered with square sets and operated by steam, water and electric power.

The smelter, costing about \$200,000, is 39x310' in size, with a 90' stack, and has a daily capacity of 300 tons. The reduction plant is terraced, handling all material by gravity, and has roast-stalls in series, with 2 McDougal calcining furnaces and two 42x120" blast furnaces, making matte of 35% to 50% tenor, which is taken in ladles by a 20-ton electric traveling crane to the conversion department, which has 2 stands of converters with 68x98" five-ton shells, turning out blister copper of 98% tenor, which is shipped to the DeLamar refinery at Chrome, N. J., for electrolytic treatment. The smelter has a good machine shop, and a small concentrator has been added for experimental work on the low-grade ores, of which the property has enormous bodies. Limestone and iron ore for fluxes are obtained on the McLeod river, six miles from the mine, but lack of suitable ferruginous ores for fluxing the high-grade sulphides materially hampers production. This is the second largest copper property of California and is asserted to have been highly profitable, though all details as to finances are withheld.

BUNKER HILL MINING & SMELTING CO.**WASHINGTON.**

Office: 714-1123 Broadway, New York. Mine office: Index, Snohomish Co., Wash. Chas. G. Reiter, president; John D. Campbell, secretary; Wilbur Morris, general manager; V. V. Clark, superintendent and engineer. Organized Oct. 24, 1902, under laws of Maine, with capitalization \$3,000,000, shares \$1 par; unissued \$569,959. Lands, 18 claims, showing sundry fissures in granite and contacts between granite and diorite, with two ore bodies undergoing development, one showing an ore chute 2' to 50' in width and about 300' in length on the lowest level, this carrying sulphide ores averaging about \$8 per ton in value. Has water power hoist, half of an Ingersoll-Sergeant single-stage 12-drill air compressor, necessary mine buildings and is served by the Great Northern railway, which passes the mine. Property is handled conservatively and is regarded as promising.

BUNKER HILL-SULLIVAN COPPER MINING CO.**WASHINGTON.**

Reorganized as Bunker Hill Mining & Smelting Co.

BUNKERVILLE MINING CO.**NEVADA.**

Mine office: Bunkerville, Lincoln Co., Nev. L. C. Bradley, superintendent, at last accounts.

BURLINGTON COPPER MINING CO.**WYOMING.**

Supposed to have property in the Encampment district of Carbon county, Wyoming, but lands not located.

BURMAH COPPER MINES, LTD.

A cheap bid for notoriety. The Burmah Agency, Ltd., was registered, without articles of association, Nov. 5, 1903, in London, with a nominal capital of £100, and at the same time this flatulent concern registered 16 subsidiary corporations, each with the same magnificent capital of £100, and each beginning its title with the word Burmah, the "Burmah Copper Mines, Limited," being one of the number.

BURNS MINING CO.**WASHINGTON.**

Mine office: Darrington, Snohomish Co., Wash. Thos. Parks, superintendent. Lands include the Myrtle and Justice claims, opened by tunnel.

BURNS-MOORE MINING & TUNNEL CO.**COLORADO.**

Mine office: Idaho Springs, Clear Creek Co., Colo. John M. Shaller, superintendent. Ores carry gold, silver, lead and copper. Has water power.

BURRA BURRA COPPER MINING CO.**AUSTRALIA.**

Office: Eagle Chambers, Adelaide, South Australia. Mine office: Burra Burra, Burra Co., So. Australia. Organized 1901, under No Liability Act of South Australia, with capitalization £120,000, shares £1 par, 10s. paid in; unissued, £24,827. T. B. Gall, chairman; V. Lawrence, secretary and treasurer; Wm. West, general manager; Jas. S. Pryor, superintendent. Lands, 672 acres freehold, with mineral rights to 11,065 acres of adjoining lands. Country rock is argillaceous slate. Mine is opened by five tunnels, of 600', 300', 330', 420' and 180'. Ores in upper levels were cuprite, malachite, azurite and native copper, occurring in very rich but irregular bunches, lower levels showing bornite and chalcopyrite. Property was opened 1845 and closed 1877, after making 51,662 long tons of refined copper. Was

reopened, 1901, by present company. Ore is shipped to Port Adelaide, 107 miles, by rail, for smelting. Fuel used is wood, costing 12s. per cord, and soft coal at 30s. per ton. Average grade of ore as now mined is about 2%, and production for 1903 was about 100 long tons of refined copper. Workings below water level were filled with water at last accounts. Has steam and electric power and employs about 30 men.

BURRAGA COPPER CO.

AUSTRALIA.

Mine office: Burraga, County Bathurst, New South Wales. Property is about one mile east of the "Lloyd" mine, and was opened in 1877. Production was 570 long tons refined copper in 1898. Ores are sulphide, occurring in a belt of highly altered rocks, ranging from porphyry to schistose slates, and carry 1 to 3 oz. silver per ton. Mine is about 800' deep. Smelter has 3 reverberatory furnaces, using wood for fuel, and product is sent as 47% matte to Lithgow, for refining.

BURRO MOUNTAIN COPPER CO.

NEW MEXICO.

Office: 402-108 Equitable Bldg., Chicago, Ills. Mine office: Silver City, Grant Co., N. M. Organized 1904, with capitalization \$50,000. Nathan F. Leopold, president; Theodore W. Carter, manager. Lands, about 500 acres, in the Burro Mountain district of Grant county, held under lease from the Southwestern Copper & Iron Co. Property has been a small producer in the past and was taken over by present corporation early in 1904. Has a concentrator in operation, and a 10-ton smelter, employing about 60 men. Management is excellent and property is being developed systematically, and on a considerable scale.

BURTON CONSOLIDATED COPPER CO.

WYOMING.

Office and mine: Encampment, Carbon Co., Wyo. R. R. Burton, superintendent, at last accounts.

BUSTER MINES SYNDICATE, LTD.

ARIZONA.

Offices: Broad Street House, London, E. C., Eng. J. A. Edmond, chairman; J. R. Shearer, secretary. Capital, £15,000; debentures, £1,600, at 10%. Property is a three-fifths interest in a copper mine said to be located in the Peck mining district of Arizona.

BUTLER-LIBERAL CONSOLIDATED MINING CO.

UTAH.

Mine office: Bingham Canyon, Salt Lake Co., Utah. Organized 1903, with capitalization \$500,000, shares \$1 par. Is a consolidation of the Ben Butler and Bingham Mining companies. A. L. Jacobs, general manager; D. R. Williams, superintendent. Is shipping ores to the United States smelter which give average returns of about 6% copper, 12 oz. silver and \$1 gold per ton. Declared a dividend of one-half cent per share, amounting to \$2,500, in October, 1903.

BUTLER MINING & MILLING CO.

UTAH.

Absorbed, 1904, by Butler-Liberal Consolidated Mining Co.

BUTTE & ARIZONA COPPER CO.

Letter returned unclaimed from Butte, Silver Bow Co., Montana.

BUTTE & BINGHAM COPPER CO.

UTAH.

Mine office: Bingham Canyon, Salt Lake Co., Utah. O. Roberts, superintendent, at last accounts. Presumably idle.

BUTTE & BINGHAM COPPER MINING & DEVELOPMENT CO.

Letter returned unclaimed from former office, 35 Congress St., Boston, Mass.

BUTTE & BOSTON CONSOLIDATED MINING CO. MONTANA.

Office: 52 Broadway, New York. Mine office: Butte, Silver Bow Co., Mont. Organized under laws of New York, with capitalization \$2,000,000, shares \$10 par. Debentures, \$1,500,000 first mortgage 6% bonds, due April, 1917. Practically the entire stock issue is owned by the Amalgamated Copper Co. Annual meeting, first Monday in April. James Phillips, Jr., president; Wm. G. Rockefeller, secretary and treasurer; John Gillies, superintendent. Lands, sundry mines and undeveloped claims in Butte, including the Silver Bow, Michael Davitt, Blue Jay, East and West Grey Rock and Berkeley mines, also several thousand acres of placer land; also claims the Tramway and Snohomish mines, which are in litigation. Silver Bow shaft No. 1 is 1,000' deep, with 3 compartments and a 16x42" hoist, with an 800-gallon Riedler pump on the bottom level. Silver Bow No. 3 has a 700' 4-compartment main shaft, with a 500-gallon Knowles pump on the 600' level. The East Grey Rock has a 1,600' 3-compartment shaft, with 20x48" hoist and 28-drill Nordberg air compressor. The Berkeley has a 900' 3-compartment shaft, with 18x32" hoist. The Blue Jay has a 2-compartment shaft 1,075' deep, sunk at an angle of 72°, with 3 compartments below the 600' level, and a 16x32" hoist. Ores are lower in copper and richer in silver than the average of the district, the blister copper carrying about 100 oz. silver per ton. The smelter has 700 tons daily capacity and does more or less custom work, the concentrator and smelter being at Meaderville, just east of Butte. The company employs 600 to 700 men when working a normal force. A dividend of \$1 per share was paid January, 1904, last preceding dividend having been \$3 in October, 1901. Production in 1903 was about 12,500,000 lbs. refined copper.

The following table gives comparative figures for the past four fiscal years ending June 1:

	1901	1902	1903	1904
Tons of ore extracted.....	214,310	189,499	245,333	202,286
Cost of mining.....	\$969,047	\$767,754	\$801,400	\$691,818
Cost of transportation	41,019	36,523	39,287	34,388
Total cost of reduction ...	551,344	404,723	524,361	682,655
Paid for labor.....	888,860	709,689	785,705	550,070
Machinery and supplies ...	631,531	462,787	540,056	211,994
Refining and marketing...	.....	199,961	281,935	.....
Net earnings.....	586,053	165,617	202,408	96,853

BUTTE CONSOLIDATED MINING CO. MONTANA.

Mine office: Butte, Silver Bow Co., Mont. J. Brown Goode, manager; E. H. Renisch, superintendent. Lands, 1,050 acres, known as the Lake Red placers, including the Ella mine, having a 700' two-compartment shaft showing auriferous and argentiferous copper ore. Property not regarded in Butte as well located.

BUTTE COPPER CO.**MONTANA.**

Supposed to be composed of eastern men and to hold bonds on the Amazon, Jessie and other claims in the eastern part of Butte, Silver Bow county, Montana. Unknown in Butte. Possibly same as Butte Consolidated Mining Co.

BUTTE COPPER MINING & SMELTING CO.**MONTANA.**

Office and mine: care of Patrick Mullins, Butte, Silver Bow Co., Mont. Organized December, 1903, with capitalization \$600,000, shares \$1 par. Patrick Wall, treasurer and manager; Samuel Hall, secretary. Property is the Dutton mine, with 250' shaft, planned to be sunk to 750', said to show 2' of chalcocite in bottom of a 50' winze sunk from the 250' level.

BUTTE GOLD, SILVER & COPPER CO.**WASHINGTON.**

Office: Spokane, Wash. Lands are about 25 miles from head of Lake Chelan, Washington, showing 2 veins, one 8' wide, opened by tunnels.

BUTTE & IOWA MINING CO.**MONTANA.**

Mine office: Butte, Silver Bow Co., Mont. John Hewett, superintendent. Property includes the Colorado mine. Has steam power.

BUTTE MINE & EXPLORATION CO.**MONTANA.**

Letter returned unclaimed from former office and mine, Butte, Silver Bow Co., Mont. Property is the Pacific mine, in East Butte, on which about \$60,000 was expended by former owners, without success. Property under attachment by Daly Bank & Trust Co., to secure an overdraft of \$2,337.83, at last accounts.

BUTTE MINING & DEVELOPMENT CO.**MONTANA.**

Dead. Went broke on the Emma mine, in East Butte, Silver Bow Co., Montana.

BUTTE & MONITOR TUNNEL MINING CO.**MONTANA.**

Office: care of C. W. Pomeroy, vice-president, 164 La Salle St., Chicago, Ills. Mine office: Butte, Silver Bow Co., Mont. Capitalization \$3,500,000. Has a 1,500' tunnel. Idle.

BUTTE REDUCTION CO.**MONTANA.**

Office and works: Butte, Silver Bow Co., Mont. Owned by Colusa-Parrot M. & S. Co., and treats the ores of the Original and Stewart mines. Smelter was practically rebuilt in 1903, and given new reverberatory furnaces planned to convert matte into blister copper without subjection to the Manhes or ordinary bessemerizing process of conversion.

BUTTERNUT GOLD & COPPER MINING CO.**ARIZONA.**

Mine office: Val Verde, Yavapai Co., Ariz. Cecil G. Fennell, general manager; S. E. Bretherton, superintendent. Has auriferous and argentiferous copper ores, with gasoline power.

BUTTON GOLD MINING CO.**ARIZONA.**

Mine office: Minnehaha, Yavapai Co., Ariz. Wm. Button, superintendent. Ores carry gold, silver and copper. Has steam power and 5-stamp mill.

MINA EL CABALLO.**MEXICO.**

Mine office: Indé, Durango, Mexico. Wm. Benton, owner; J. M. De La Torre, superintendent. Has steam power and produces silver and copper,

with a force of about 50 men. Said to be under option to Guggenheim Exploration Co.

MINA CABALLONA.**MEXICO.**

In the Arizpe district of Sonora, Mexico, about 15 miles south of Douglas, Arizona. Shipped some copper ore carrying gold and silver values to smelters at El Paso, in 1903.

CABEZAS DEL PASTO MINES.**SPAIN.**

Mine office: Puebla de Guzman, Huelva, Spain. Owned by C. & J. Sundheim, who have operated the property since 1887. Wm. Guthrie Bowie, general manager; Don Jorge Riecken, superintendent. Lands, 6 concessions, area 104 hectares, with about 300 hectares of adjoining lands, having 12' shafts, deepest 104 metres, with 5,000 to 6,000 metres of underground openings. Ore developed for immediate mining is estimated at 750,000 tons of pyritic ore, and 1,500,000 tons of cupriferous schists. Lenses apparently increase in size at depth. Mine is opened by overhand stoping and dry-walling is used in depleted stopes. Ores carry 1.5% to 5% copper, 40% to 52% sulphur and 40% to 44% iron, and the schists range 0.25% to 30% copper. All pyritic ore above 1.5% copper, and all schists above 10% copper, are exported. The lower grade ores are weathered at the mine, to produce cement copper, and the leached ore, free of copper, is sent to France for the sulphur contained. The water from the mines, where 80,000 to 100,000 cubic metres are in constant storage, carries up to 9 kilograms of copper in solution to each cubic metre, most of which is saved by cementation. The cement copper is washed and classified, the best quality averaging 98.5% copper, which is much the best grade of cement copper produced anywhere. Mining by overhand stoping and rock filling is said to prove safer and cheaper than open-cast operations. Surface plant includes Robey hoisting and pumping engines, and the mine has a tramline of 76 cm. gauge, also an aerial tram to the wharves at La Laja, on the river Guadiana.

CABRALES COPPER SYNDICATE, LTD.**SPAIN.**

Offices: 18, Walbrook, London, E. C., Eng. R. W. Outram, secretary. Capital, nominal, £12,000; issued, £1,207. Lands, if any, in Spain.

CABRERA MINING CO.**MEXICO.**

Letter returned unclaimed from former mine office, Velardeña, Durango, Mexico.

MINAS y FUNDICION DE CACOMA.**MEXICO.**

Office and works: Autlán, Jalisco, Mex. Wm. A. Cassils, agent; John Mann, mine superintendent; M. E. Raines, smelter superintendent. Lands, 5 hours' horseback ride northwest of Autlan, including the Volcancillos, Purisima and Palestina mines, carrying auriferous and argentiferous copper ores, opened by a 165' shaft and a 160' tunnel. Has steam power and a 10-ton smelter, employing 50 to 60 men.

CACOMA MINES & SMELTER CO.**MEXICO.**

See Minas y Fundicion de Cacoma.

CACTUS GROUP.**UTAH.**

Owned by Newhouse Mines & Smelter Co.

CACTUS SMELTING & COPPER CO.**UTAH.**

Absorbed by Royal Copper Mining Co., now Newhouse Mines & Smelter Company.

SOCIEDAD ANONIMA MINAS DE CALA.**SPAIN.**

Offices: Bilbao, Vizcaya, Spain. Mine office: Cala, Santa Olalla, Huelva, Spain. Organized, Aug. 31, 1900, under laws of Spain, with capitalization 15,000,000 pesetas. Conde de Rodas, president; Don Emilio Vallejo, secretary. Property is a group of 8 mines, area 346 hectares at Cala, carrying magnetic iron ore and cupriferous pyrites, and ore bodies apparently are extensive. The company is building a 97-kilometre railroad from the mines to San Juan del Aznalfarache, on the Guadalquivir river, in the adjoining province of Sevilla.

CALABASAS COPPER CO., LTD.**ARIZONA.**

A Douglas Lacey swindle, in Pima county, Arizona.

CALAVERAS MINING ASSOCIATION.**NEW MEXICO.**

Mine office: Alamagordo, N. M. E. A. Hersperder, superintendent. Lands include the Black Burro mine, showing sulphide ores of copper and lead.

CALCANTE COPPER & NICKEL MINES.**ITALY.**

An idle property near Traves, Torino, Italy, in the western Alps of Piedmont. Once a large producer of nickel, cobalt and copper, latter from chalcopyrite, found in stratified archaic rocks.

CALEDONIA COPPER CO.**MICHIGAN.**

A proposed organization to take over the Flint Steel and adjoining mines, in Ontonagon county, Michigan. Company not formed.

CALEDONIA COPPER CO., LTD.**NEW CALEDONIA.**

Offices: 79½, Gracechurch St., London, E. C., Eng. Mine office: Noumea, Diahot district, New Caledonia. Geo. Allan, president; James W. Chenhall, consulting engineer; A. J. Lindsay-Simpson, secretary. Lands are about 4,000 acres, including the Ao and Pilou mines. Direct title is held by Les Mines de Cuivre Pilou, Ltd., entire stock issued of which is owned by Caledonia Copper Co., Ltd. Capitalization, £750,000, shares £5 par. Debentures, £100,000 authorized; £46,000 issued at 7.5%. The Pilou mine has been extensively developed and is connected by tunnel with the Ao, 2.5 miles distant. Main shaft, 240 metres. Ores are carbonates and oxides near surface, succeeded at slight depth by argentiferous chalcopyrite and galena. Ore is dressed to tenor of 13% to 15% copper, the concentrated ore carrying 200 to 400 grams of silver per ton from the sulphide ores and 2 to 4 grams gold per ton from the oxidized surface ores. Plant includes a 200-ton concentrator. Company was promoted by the notorious London & Globe Finance Corporation, Ltd., and apparently was robbed before horn. Company in poor financial condition and properties, which are regarded as valuable, are idle.

CALEDONIAN EXPLORATION CO.**MEXICO.**

Mine office: San Nicolas del Oro, Guerrero, Mex. T. B. C. Murphy, superintendent. Property is the Nantzintla mine, carrying ores of gold, silver and copper, opened by tunnel.

CALEDONIAN MINING CORPORATION, LTD. NEW CALEDONIA.

E. Wells, receiver and manager, 66, Coleman St., London, E. C., Eng. Property comprises sundry lands carrying ores of copper, silver and lead, in New Caledonia.

COMPANIA MINA DE CALIFORNIA. MEXICO.

Letter returned unclaimed from former mine office, Cumuripa, Sonora, Mexico. Organized 1901, with capitalization \$1,000,000. Lands, 20 pertenencias.

CALIFORNIA-AMECA MINING CO. MEXICO.

Mine office: Ameca, Jalisco, Mex. G. W. Whitney, manager. Is developing the San Pedro copper mine.

CALIFORNIA & ARIZONA COPPER MINING CO. ARIZONA.

Office: care of Pacific States Mining & Investment Co., a shady bankrupt promotion concern at 326 Post St., San Francisco, Cal. Lands, 7 claims in the Huachuca Mountains, Cochise Co., Ariz., 17 miles west of Bisbee. Cannot be learned that any work is in progress, and stock probably worthless.

CALIFORNIA COPPER CO. CALIFORNIA.

Office: 31 Nassau St., New York. Property is the Ne Plus Ultra and adjoining claims, near Daulton, Madera Co., Cal. Has a 100-ton smelter, but ores proved refractory and unsuited to economical extraction. Moribund.

CALIFORNIA COPPER KING CO. CALIFORNIA.

Letter returned unclaimed from former office, 218 So. Broadway, Los Angeles, Cal. Lands, were 21 claims, in two groups, on Pahlen and McCoy mountains, Riverside county, California, opened by shafts showing various ore bodies, 4' to 40' wide.

CALIFORNIA GOLD & COPPER CO. CALIFORNIA.

Mine office: Spenceville, Nevada Co., Cal. C. C. Bitner, president and general manager. Has auriferous and argentiferous copper ores, with water and electric power, and employed about 20 men at last accounts.

CALIFORNIA IMPROVEMENT CO. CALIFORNIA.

See Realty Syndicate.

CALIFORNIA MINING CO. COLORADO.

Office: 2 Toltec Bldg., Denver, Colo. Letter returned unclaimed from former mine office, Rollinsville, Gilpin Co., Colo. Emerson J. Short, president and general manager. Has a 100' shaft said to show a 2' paystreak of argentiferous and auriferous chalcocite assaying 25% to 40% copper.

CALIFORNIA MINING CO. UTAH.

Mine office: Park City, Summit Co., Utah. S. Levy, superintendent. Ores carry gold, silver, lead, copper and zinc. Has steam power and a 50-ton concentrator, employing about 50 men at last accounts.

CALIFORNIAN COPPER SYNDICATE, LTD. CALIFORNIA.

Absorbed by Fresno Copper Co., Ltd.

MINA DA CALINNHA. PORTUGAL.

Office: care of M. Paul Chapuy, manager, Santa Appolonia, Lisbon, Portugal. Understood to be owned by a French company. Exports cupriferous iron pyrites to England in limited quantities.

CALLETANO MINING & SMELTING CO.**ARIZONA.**

Mine office: Calabasas, Pima Co., Ariz. C. O'Brien Reddin, general manager. Lands, 2 groups, showing 12 veins, from which selected samples have given assays of 9% copper, 400 oz. silver and \$2.50 gold per ton.

CALSTOCK TIN & COPPER, LTD.**ENGLAND.**

Offices: 16, Place Vendome, Paris, France and 30, Moorgate St., London, E. C., Eng. Mine office: Calstock, Cornwall, England. G. Robinson, chairman; C. Fred Thomas, mine manager; John A. Russell, secretary. Organized May 5, 1900, with capitalization £60,000, shares £1 par; issued, £57,707. Property is the Prince of Wales mine, product of which is mainly tin, with a little copper secured as a by-product. Is a small producer of both tin and copper ores.

CALUMET & ALGOMA DEVELOPMENT CO.**ONTARIO.**

Succeeded by Hermina Mining Co., Ltd.

CALUMET & ARIZONA MINING CO.**ARIZONA.**

Office: Calumet, Mich. Mine office: Bisbee, Cochise Co., Ariz. Works office: Douglas, Cochise Co., Ariz. Employs about 750 men. Organized March, 1901, under laws of Arizona, with capitalization \$2,500,000, shares \$10 par; issued \$2,000,000. Annual meeting, second Monday in April. Chas. Briggs, president; James Hoatson, vice-president; Gordon R. Campbell, secretary; Peter Ruppe, treasurer; preceding officers, Thos. Hoatson, Thos. F. Cole, Chester A. Congdon, Chas. d'Autremont, Jr. and Geo. E. Tener, directors; Samuel A. Parnall, general manager; James Wood, smelter superintendent; Henry B. Paull, clerk; W. E. McKee, master mechanic; H. A. Smith, engineer. Merchants & Miners Bank, of Calumet, Mich., registrar. Lands, 11 claims, area 160 acres, in the Warren district, adjoining the Copper Queen, also a 640-acre smelter site at Douglas.

The company's shafts are in limestone, with occasional porphyritic intrusions and not far distant from a porphyry contact. Side-line agreements have been secured with the Copper Queen, insuring freedom from possible litigation and a preservation of the present neighborly relations. The surface gives small indications of values, showing but small and infrequent outcrops, the existence of the magnificent ore bodies since developed having been inferred correctly from the underground developments in the adjoining shafts of the Copper Queen and from careful study of the general geological conditions of the district. Ore occurs in highly irregular bodies, the mine showing native copper, cuprite, melaconite, azurite, malachite, chalcocite and chalcopyrite, usually with a talcose gangue and with considerable hematite and manganese ores, the latter carrying malachite in small disseminated nodules and frequently averaging 10% to 18% in copper. The ore, which is practically self-fluxing, averages about 2 oz. silver and 0.05 oz. gold per ton, as smelted.

The original mine, so far as yet developed, is on a single claim of 20 acres, the Irish Mag, on which a finely timbered 4-compartment vertical shaft of 1,280' depth is sunk, in hard limestone throughout, except where cutting the various ore bodies, rendering it safe from drawing. The mine is opened by

drifts and crosscuts on the 750', 850', 950', 1050', 1150' and 1250' levels. The upper levels show exceedingly rich ores, there being whole stopes assaying 40%, 50% and even 55% in copper, and a considerable body of rich chalcocite was opened on the 750' level late in 1904. A good ore body has been opened recently on the Pride claim, by a drift from the 1250' level of the Irish Mag shaft. An auxiliary double hoist is being installed on the 1,000' level of the Mag shaft.

The collar of the Oliver shaft is 150' lower than the Mag and 50' higher than the Lowell shaft of the Queen. This shaft, 1,000' deep, first cut ore at 710' depth, or about 300' higher than in the Lowell, and rich ore is being opened on both of the Senator claims from this shaft. The Oliver plant has a double-drum hoist good for 1,500' depth and a battery of oil-burning boilers. This shaft will become a rich producer in 1905. The lower workings show rich sulphides, and in order to save the high-grade ores in the upper levels, for fluxing and enrichment of the average furnace charges, development is being pushed more rapidly in the sulphide zone than above, yet practically all of the oxidized ores now smelted come from development work alone. It is planned eventually to sink both shafts to a depth of 2,000', or even more, should the ore bodies hold out. The shafts have 4 compartments and make very little water, but the mine may become wet at a depth of 1,500' or more. The ground is exceedingly soft, owing to the amount of talc-gangue in the ore bodies, and requires heavy timbering. Timber is secured from a great distance, and to guard against emergencies, large stocks are carried. The Irish Mag shaft has developed a mine with ore in sight to run the smelting plant to its full capacity for at least 5 or 6 years to come, without another foot of opening, and this single shaft soon will be reinforced by another, to say nothing of the lower levels being opened. The great extent and marvelous richness of the Calumet & Arizona's Irish Mag stopes can be comprehended only by personal inspection. This I have given, and know that this statement of the mine's richness is a very conservative one, despite its possible appearance of a contrary nature.

The surface plant is clustered about the Irish Mag shaft on a steep hillside, graded for the purpose. The shaft has a 78' steel gallows-frame and a 114' ore bin, with a 20x60" direct-acting Nordberg hoist capable of raising a 3-deck cage at the rate of 2,000' per minute from a depth of 1,600'. This hoist has raised about 600 tons of ore daily from an average depth of nearly 1,000', beside caring for men, timber and tools—a record never before made by one shaft in Arizona. The plant includes carpenter and machine shops, smithy, timbermill for framing mine-sets, office building, warehouse, etc. Four 40-h. p. Buffalo vertical engines, direct-connected to 25-kw. 115-volt Crocker-Wheeler generators furnish electric light and power for the ventilating fans. An automatic telephone system has 25 stations underground and on surface. A 16-drill air compressor was installed in 1904, the power-drill equipment being comparatively small because of the softness of the ore, much of which can be bored with a breast-auger. A substantial hospital for mine employees was built in 1904 and a model changing house, with hot and cold

running water, tub and shower baths and lockers for 500 men is nearing completion.

To the southward of the Senator claim No. 2 is the Buckeye claim, with a 40' exploring shaft and a few trenches, dating from a former ownership. This claim shows a good iron outcrop and a little low-grade carbonate ore. The southernmost claim is the Gibraltar, wedged between the lands of the Pittsburg & Duluth and Lake Superior & Pittsburg properties, the Gibraltar claim also having shallow exploring shafts and open-cuts showing iron and a little low-grade copper ore of promising appearance. The company also owns two detached tracts, one being the Wagner and Hope claims, about 2,000' southwest of the Irish Mag, while the other group is the Angel, Old Republican and Washington claims, adjoining the old Copper King mine, on the porphyry side of Tombstone Canyon. The latter group was secured as a possible mill-site, but in view of recent developments at the Junction property, may prove to carry workable ore bodies at depth.

The Calumet & Arizona smelter is 25 miles from the mine, near Douglas, ore being transported by the El Paso & Southwestern R. R., which gives a very favorable freight rate. The first stack was blown in November 15, 1902, the second in the spring of 1903, the third in October, and the fourth in 1904, while the fifth was under way at the close of the year. The furnaces are of 300 tons daily capacity each, and but two furnaces were run regularly in 1904, the third being held in reserve. With 5 furnaces in commission, early in 1905, the smelter will have a nominal capacity of 1,500 tons daily, and an actual capacity of 1,200 tons, or double the capacity of 1904, as the fifth furnace will be held in reserve to replace any one of the others out of blast for repairs or any other reason. Matte is discharged by the furnaces into tilting wells and taken thence by electric crane to the converters, four in number, which turn out 99.2% blister copper carrying small gold and silver values. Power is furnished by a 400-h. p. engine and the handling of raw and finished material is as nearly automatic as possible in every process of the work. The power plant includes two Nordberg blowing engines, with cross-compound steam ends having 22x42" cylinders and 48" stroke, the blowing cylinders being 48x48", and maintaining a 12 lb. blast pressure, each blower being run by a 400-h. p. steam engine. The smelter power plant burns petroleum, and has four 45,000-gallon oil tanks. Water in ample supply is secured from artesian wells, of about 450' average depth, these giving a natural overflow without pumping. The company has a 16-room boarding house and sundry dwellings for employes at the smelter. Product of the smelter is a high-grade blister copper, carrying in 1903 an average of \$11.35 per ton in gold and silver values, which goes by rail to Galveston, thence by sea to the works of the Nichols Chemical Co. at New York for electrolytic refining.

The Calumet & Arizona has no "construction account," that convenient device by which "mining profits" are earned by some companies, when the results properly figured would show an actual loss on every pound of metal produced. All construction costs at mine and smelter are charged direct to operating expenses.

Actual copper production has been 2,066,676 lbs. in 1902; 25,535,857 lbs. in 1903, and 31,634,895 lbs. in 1904. For 1905, no prediction can be made with safety, but when the Oliver shaft goes into commission, with 4 furnaces in blast, if none of the furnaces are lent to auxiliary companies, the Calumet & Arizona easily can make between four and five million pounds monthly, or from 50,000,000 to 60,000,000 lbs. per year. This will be pretty nearly the mine's ultimate capacity for several years to come, because the ore cannot be raised more rapidly through two shafts, but there is room for one or two more shafts, if it should be wished to increase production.

The Calumet & Arizona has been magnificently handled in every detail. It would be difficult to point out any small mistake, and impossible to point out any large error in any part of the company's plan of development, finance or operation. No other great copper mine ever has been developed so rapidly, and none other has become a dividend payer so quickly. Within 13 months of its first smelter run the first dividend was paid. In 1903, the dividends were \$400,000, and in 1904, \$1,300,000. The regular quarterly dividend rate of \$1.50 was supplemented by a 50 cent extra in December, 1904, and the 1905 rate will be, in all likelihood, \$2 per quarter, or \$8 per year.

The cost of copper made in 1904, probably was about 7 cents per pound, owing to charging all improvements direct to operating costs. Cost of electrolytic refining, commissions, freight, insurance, assaying, sampling and weighing, averaged 2.3 cents per pound in 1903, against which was the average credit of .5675 cents per pound for included gold and silver values. Net earnings for 1904, probably were nearly \$1,750,000, and the company probably ended the year with a surplus of between \$1,250,000 and \$1,500,000.

Under the same general and local management as the Calumet & Arizona, and with largely the same shareholders, are four other companies, these being the Lake Superior & Pittsburg, Pittsburg & Duluth, Calumet & Pittsburg and Junction Development Co. The two first named have large ore bodies developed and can become producers in 1905, if given smelting facilities. A consolidation between these five companies is almost certain to come in time. Such a consolidation will give, in the course of a few years, the greatest copper mine of the world, in point of production and net profits.

CALUMET & BISBEE DEVELOPMENT CO.

ARIZONA.

Office: Calumet, Mich. Mine office: Bisbee, Cochise Co., Ariz. Organized Oct. 20, 1902, under laws of Arizona, with capitalization \$400,000, shares \$10 par; 15,000 shares issued and fully paid in. Frank S. Carlton, president; Wm. R. Oates, secretary; Geo. O. Beehler, manager. Lands, 14 claims, area 262 acres, in two groups, known as the Blair and Denn, at Don Luis, adjoining the Lake Superior & Pittsburg. Has a 960' main shaft. Idle, owing to lack of funds. Fully described in Vol. IV.

CALUMET & COCHISE DEVELOPMENT CO.

ARIZONA.

Out of business. Fully described in Vol. IV.

CALUMET COPPER CO.

COLORADO.

Office: 409 Tacoma Bldg., Chicago, Ills. Mine office: Turret, Chaffee Co.,

Colo. Hon. Wm. E. Mason, president; David W. Medbury, secretary; Elmer E. Briggs, general manager; G. W. Mendenhall, superintendent. Lands, 3 claims, known as the Copper King group, on Middle Mountain, showing schistose veins in a formation of micaceous granite with porphyry intrusions, carrying auriferous and argentiferous copper oxides and sulphides. Development is by incline shafts of 40' and 85'.

CALUMET COPPER MINING CO.**WASHINGTON.**

Dead. Property sold under foreclosure.

CALUMET & DULUTH DEVELOPMENT CO.**ARIZONA.**

Out of business.

CALUMET & HECLA MINING CO.**MICHIGAN.**

Office: 12 Ashburton Place, Boston, Mass. Mine office: Calumet, Houghton Co., Mich. Is one of the largest copper producers of the world, and employs about 5,000 men. Organized 1871, under laws of Michigan, as a consolidation of the Hecla, Calumet, Portland and Scott mining companies, and reincorporated, 1900, for 30 years. Capitalization \$2,500,000, in 100,000 shares, par \$25; \$12 paid in. Has paid dividends of \$87,850,000 to close of 1904, or \$878.50 per share. Has 3,258 shareholders of record. Fiscal year ends April 30; annual meeting is in August. Alexander Agassiz, president; T. L. Livermore, vice-president; Geo. A. Flagg, secretary and treasurer; Alexander Agassiz, Francis L. Higginson, Francis W. Hunnewell, Quincy A. Shaw, Jr., and Jas. N. Wright, directors; James MacNaughton, superintendent; Will A. Childs, assistant superintendent; W. M. Gibson, second assistant superintendent; J. H. Lathrop, chief clerk; Fred S. Eaton, cashier; E. S. Grierson, chief engineer; E. D. Leavitt, consulting mechanical engineer; Jas. Milligan, chief mining captain; W. H. Cake, mill superintendent; Jas. B. Cooper, smelter superintendent at Lake Linden; Morris B. Patch, smelter superintendent at Buffalo; Senator Chas. Smith, chief mill and smelter clerk at Lake Linden; Geo. M. Kendall, chief clerk at Buffalo.

Official returns to the State of Michigan, as of date Jan. 1, 1904, disclose the following figures:

Amount cash paid in on capital stock	\$ 1,200,000.00
Entire amount invested in real estate	17,241,851.08
Amount of personal estate	6,348,941.25
Amount of unsecured or floating debt	1,019,930.97
Amount due corporation	2,542,846.37

Mineral lands are about 2,750 acres, in a compact tract in Sections 11, 13, 14, 15, 22, 23 and 24, Town 56 North, Range 33 West, Houghton county, Michigan, also considerable tracts west of the Tamarack mine carrying the underlay of the Calumet conglomerate at such stupendous depth that its opening would require a vertical shaft of about two miles in depth. The lands west of the Tamarack were explored in 1904 with diamond drills, in search of a supposed cupriferous conglomerate. The Metalline and Dover tracts, area 200 acres, lying next south of the Tecumseh, were bought 1904, and the Tecumseh is supposed to be held under option also. Further purchases of mineral lands, both north and south of present holdings, may be made. The

company also owns extensive tracts of timber land in Michigan and Wisconsin.

The Calumet & Hecla mine proper is opened on the Calumet conglomerate, which to the north and south has proven unprofitable wherever mined, though the underlay of the lode, opened by vertical shafts at the Tamarack mine, has given good returns. The conglomerate has an average strike of N. 39° E., with average dip to the west of north of 37° 30' with the horizon. The lode has a minimum width of 8' and a maximum of 40', with an average of about 12' to 14', giving about 2,400 cubic fathoms of stoping ground, equal to about 43,200 tons of stamp-rock, per acre of area. The Osceola amygdaloid, outcropping 730' east of the Calumet conglomerate, has a parallel strike and an average dip of about 40°. The Kearsarge amygdaloid, which is very rich to the northward, also underlies the Calumet & Hecla lands, outcropping some distance east of the Osceola lode. The Calumet amygdaloid, lying between the conglomerate and the Osceola amygdaloid, has been little opened, but might prove payable if developed, as it shows some very rich ground in a crosscut on the 900' level.

The Calumet & Hecla mine in reality is many mines in one. The Calumet mine at the north, the Hecla in the center and the South Hecla at the south form one continuous mine developing the Calumet conglomerate by incline shafts. The Red Jacket shafts opens the same lode vertically. The Osceola amygdaloid is opened by 5 shafts and the Kearsarge amygdaloid is being opened by two new shafts, with more to follow. The mine has 21 shafts, of which 15 are working, 4 are idle and 2 are permanently abandoned. The conglomerate, opened for two miles along its outcrop, has 11 shafts, 8 being single compartment size, which means single hoisting compartments, two with double compartments and one 6-compartment vertical shaft. The 5 Osceola shafts have double compartments each, as have the shafts started on the Kearsarge bed. The trap and amygdaloid walls of the conglomerate carry considerable copper, especially the footwall bed, and much of the adhering trap rock formerly rejected is now milled.

The incline shafts on the conglomerate are worked as two separate mines, known as the Hecla and Calumet branches, the South Hecla being a southerly continuation of the Hecla branch. The shafts on the outcrops are as follows, from north to south: Nos. 6 and 5 Calumet, two compartments each; No. 4 Calumet, one compartment, with a vertical depth of 4,748' and an actual depth of 8,100' at an angle of 37° 30', in addition to which there is a winze of 190' from the bottom, giving a total depth of 8,290' from the collar of the shaft to the bottom of the winze; No. 3 Calumet, abandoned; No. 2 Calumet, with one compartment 7,000' deep and near the boundary; No. 1 Calumet, abandoned; No. 1 Hecla, abandoned; No. 2 Hecla, 4,400' deep, has reached the Tamarack boundary; No. 3 Hecla, 4,000' deep, also has reached the Tamarack boundary; No. 4 Hecla, abandoned; No. 6 Hecla, one compartment, 6,200' deep, with ground to sink 8,500'; Nos. 7 and 8 Hecla, one compartment, 6,300' deep and can sink to 9,000'; Nos. 9 and 10 Hecla, two compartments, 6,500' deep and can go to 8,100'; No. 11 Hecla, 2,400' deep, with poor ground

at bottom and being gutted from the bottom up; No. 12 Hecla, at the company's south line, 6,700' deep and bottomed in unprofitable ground.

Pillars 75' wide are left on either side of every shaft, and when the present conglomerate workings are exhausted down to the Tamarack line, the pillars will give a product equal to about 18% of all the rock previously mined. The mine is opened for about 8 years in advance of immediate requirements, possibly too far ahead for such soft ground, and has about 200 miles of shafts, drifts, winzes and crosscuts. The quantity of timber used in the mine is about 30,000,000' annually. Electric pumps are in use on the 48th level of No. 7 Hecla and elsewhere, and are said to give satisfaction. Electric underground haulage is understood to be under consideration and probably could be introduced profitably.

The Red Jacket vertical shaft, 4,920' deep, was started in 1888, and cut the lode at a depth of 3,287'. When first bottomed the rock temperature in the sump was 87.60° Fahrenheit (31° Centigrade), but after connection was secured with No. 4 Calumet the temperature was reduced to between 70° and 80° Fahrenheit, exhaust air from the power drills aiding in cooling the mine. The Red Jacket shaft was designed to open a mine unconnected with the older workings in order to give reserve stopes in case of a mine fire, but the heat and danger were so great that connection was made with the older shafts. The conglomerate lode at this point and depth is not up to its usual values being wide but considerably below the Calumet & Hecla average content in copper, and during 1903 and 1904 has shown a falling off of about 15% from former values. It is evident, from the results secured by this and the other deep shafts of the district, that while the cupriferous stratified beds may descend to tremendous depths, the copper values do not hold out at depth. The Red Jacket shaft hoists rock from all the north shafts below the 56th level, at which point the conglomerate is intersected. Production is about 1,200 tons daily, or double the former output, the increase having been secured by swinging Kimberley skips under the cages. In the east compartments of this 6-compartment shaft are two 9-ton Kimberley self-dumping skips. The two west compartments have double-deck cages for men and material, and the two middle compartments have cylindrical steel bailers, which have given good results in freeing the mine of water. Electric turbine pumps were tried experimentally in this shaft in 1904, with satisfactory results. Iron pillars are used extensively, as supports in portions of the crosscuts connecting the shaft with drifts on the lode, and also in various incline shafts to support the hanging wall. Iron also is used for lagging to some extent, material being mainly scrap, such as worn-out skip-rails, cut to 10' lengths and placed above "I" beams. The Red Jacket shaft has 9-ton steel storage bins at its various productive levels, aiding in maintaining the uninterrupted hoisting service that is absolutely necessary in a mile-deep shaft raising 1,200 tons of rock daily, in addition to meeting the heavy demands made for handling men, timber and supplies. The cages were fitted with tail-ropes in 1904, these materially modifying the unpleasant and even dangerous vibration formerly noted in the hoisting cables.

The Calumet & Hecla owns 200 acres, known as the "five forties," between the Tamarack and the Tamarack Junior mines. These lands carry the underlay of the conglomerate at great depth, and to obviate sinking a deep and costly vertical shaft this tract is being opened by a blind shaft, which starts 1,500' east of the Red Jacket vertical, and near the bottom of Calumet No. 4, which abuts on the Tamarack boundary line at a depth of 8,100'. No. 4 has opened some of the best ground of the entire mine, the lode having an extreme width of nearly 40' at points, and being notably rich from the 3,600' to the 4,500' level. The blind shaft is being sunk 25' under the footwall, at the same angle as the dip of the conglomerate, thus assuring solidity of walls without necessitating long and expensive crosscuts to the lode on each level. A "footwall drift" on the 57th level parallels the regular drift at a distance of 25' in the footwall, between the Red Jacket vertical and the blind shaft, thus obviating the confusion almost certain to result were the regular drifts given double duty. The blind shaft starts from the footwall drift under and parallel with the 57th level, and will be about one mile in depth, opening four of the five 40-acre tracts, leaving the fifth and last to be opened by sub-shafts from the blind shaft. At the close of 1904 the blind shaft is 200' deep. Owing to the regular incline shafts being sunk on the dip of the lode, while the blind shaft must follow the section lines, it will descend diagonally on the dip of the lode giving an average dip of about 22° only, although the lode dips at 37° 30'. This flat incline will permit the hoisting of rock in tram-cars, which will be hauled through the blind-drift and dumped in the steel bins of the Red Jacket shaft for hoisting, thus saving transfer at the mouth of the blind shaft.

Shafts 13 to 17, inclusive, numbered from south to north, are on the Kearsarge amygdaloid lode, 730' east of the outcrop of the conglomerate, with parallel strike and dip and frequent underground connections by crosscuts. These shafts average 1,400' depth each, and have about 20 miles of drifts opened for stoping. The amygdaloid shafts were closed in 1901, and remained idle until July 1, 1904, when No. 13, the southernmost was reopened and since has supplied rock to the mills. The rock is said to run a little under 15 lbs. refined copper per ton. No. 14 is 3,200' north of 13; No. 15 is 2,600' next north; No. 16, 1,800' next north and No. 17 is 1,800' north of 16. No. 18 is merely a site for another possible shaft at the extreme north of the Calumet & Hecla tract, on the Osceola lode.

The Kearsarge lode is 2,200' east of the Osceola and 2,930' east of the Calumet conglomerate, with which it is parallel in strike, and practically parallel in dip. The work of development was begun August, 1903, and at the close of 1904, two permanent shafts are sinking. No. 19, the northernmost, is about 1,000' south of the north boundary, with drifting in progress on the first and second levels. The openings are satisfactory, showing good stamp rock, carrying probably 18 to 22 lbs., fine copper per ton, with reasonable selection, and the footwall is fairly charged with fine copper, always a sign of strong and persistent mineralization. This shaft is a new departure in Lake mining practice, being "timbered" with steel, brick and

concrete. The shaft has 3 compartments, 2 for hoists, and the hanging wall is lined with 3 arches of brick, laid in 3 to 5 courses, thickness being increased with depth, supported by two rows of steel "I" beams, serving also as dividers for the shaft. No. 20 shaft, on the Kearsarge, is 2,400' south of 19, with a much similar copper showing and similarly "timbered" with brick, concrete and steel. Drifting has begun on the first level. No. 21, 8,000' south of 20, is as yet a vertical exploratory shaft only.

The Calumet & Hecla has suffered severely from underground fires. The amygdaloidal trap rock carrying native metal cannot burn, like the copper ore mines rich in sulphur, such as the Anaconda, United Verde, Mount-ain and others, but the old timbering eventually becomes nearly as inflammable as so much tinder. The really serious mine fires have been five in number, occurring in 1884, in July and November 1887, and on Nov. 30, 1888, and May 27, 1900. All possible precautions are taken against mine fires, these including the partial fire-proofing of all mine timber with chloride of zinc solution, regular sprinkling of all shafts, the maintenance of water-pipes and hydrants, fire-hose, chemical engines, an electric system and 18 telephones at various pump stations from the 8th to the 51st levels inclusive, in five different shafts, so distributed as to be most readily accessible from all parts of the mines. From the first four fires the Calumet & Hecla suffered aggregate losses of several millions of dollars, while a number of lives were lost and three valuable shafts were drawn so badly that they were abandoned. The fifth and latest fire, in May 1900, severely tested the mine's system of fire prevention and extinguishment, the fire breaking out on Sunday evening, when the mine was deserted by all but a few employees, and having gained great headway before it was discovered and the burning portion of the mine shut off by closing the fire-doors. The mine was sealed at surface by covering the mouths of the shafts with heavy timbers and tamping dirt tightly into the crevices between. Wherever gas escaped through holes in the earth, dirt was tamped in and made solid with water. The fire was extinguished in three weeks and the South Hecla portion of the mine continued working without interruption. The five serious fires, and sundry smaller blazes nipped in their inception, all have been of mysterious origin, and there are grounds for suspecting incendiarism. Great precautions are taken to prevent unauthorized persons entering the mine, and permission to go underground is given only by the president, in writing, each pass being for one trip only.

As a rule the richer portions of the conglomerate are in the central part of the Calumet & Hecla tract, the most notable exception being in No. 4 Calumet shaft. Nos. 10 and 12, the southernmost shafts of the South Hecla, are being gutted, pillars being robbed from the bottom upward. Hecla shafts 6, 7 and 8 show very good ground. To the north of No. 5 Calumet there is a considerable stretch of lean ground up to the north boundary.

The surface equipment of Calumet & Hecla is the most complete owned by any mine. With rare exceptions everything is duplicated, to prevent possible delays or suspension through fire or accident. The carpenter shops are of great size and fitted with every modern wood-working appliance.

The smithies are larger than may be found elsewhere outside of the works of a few of the very largest machinery manufacturers, and are supplied with steam-hammers, forges, blowers, emery-wheels, grindstones, etc. The Calumet smith shop sharpens upwards of fifty tons of steel drills daily, requiring the services of a small regiment of drill boys for transport between the shops and mines, while forging and general blacksmithing are done at the Hecla shops, to which a stone addition of 56x152' was built in 1903. Upwards of one hundred blacksmiths are employed in the various shops. The machine shop, 225x250', is very complete in equipment, turning out an immense variety and quantity of work. The company has a very large brick warehouse for general supplies, and special warehouses for steel and iron, paints, etc., all having direct connection with the Hecla & Torch Lake Railroad, a private line operated by the company that connects the mine, mill and smelter by some 20 miles of main track, spurs and sidings that reach every shaft, shop, warehouse and mill. The road has big locomotives and a large equipment of rolling stock.

The shaft-rockhouses at the incline shafts are of uniform pattern. At each the rock is hoisted to the top of the shafthouse, passing thence over grizzlies that allow the finer rock to fall through, the larger masses being reduced in 24x36" crushers of the jaw type, and going to 18x24" crushers on the floor beneath. The crushed rock falls by gravity into storage bins whence it is dumped into hopper-cars that take it to the mills, railroad tracks running underneath each rockhouse.

The power plants at the main mine on the Calumet conglomerate, include six hoisting plants and four large boiler plants. The hoisting engines of the conglomerate mine are among the most powerful in the world, ranging from 1,000 to 8,000 h. p. each. Miners are taken in and out of the incline shafts by man-cars, these being long trucks having tiers of circus seats, and replacing the regular skips when needed, being quickly shifted on or off the skip-tracks by powerful cranes. This method has proven the safest, cheapest and quickest yet devised for moving men in and out of deep incline shafts.

At No. 4 Calumet shaft there is a group of the most powerful machinery ever built. The brick engine house, 62x146', contains the Corliss engine "Superior," of 4,700 h. p., with 40" cylinders and 70x72" stroke; the auxiliary engines "Baraga" and "Rockland," of 2,000 and 600 h. p. respectively; two Rand air compressors of 25 and 40 drill capacity, and the engine "Mackinac," a quadruple-cylinder triple-expansion steel giant of 7,000 h. p., operating 3 Nordberg air compressors with a combined capacity of 500 drills. In the old Leavitt compressor water was injected into the compression cylinders, while the Nordberg machines deliver the compressed and greatly heated air to a cylindrical steel cooler 12' in diameter and 30' high, into which water is sprayed from above and drawn off at the bottom, this cooling the air to 80° Fahrenheit (27° Centigrade). The hoist has four drums, each 8' 6" wide and 20' 6" in diameter, operating four different shafts, two of these drums carrying nearly 2 miles of steel cable each. Power is supplied by batteries of boilers in two boiler-houses adjoining, these having a brick chimney 250' high,

with inside diameter of 12' 6". Locomotives haul the coal into the boiler-houses, where it is fed to the grates by automatic stokers.

The Hecla engine-house is of brick, 47x80' in size, flanked by a large boiler-house, and contains the compound hoisting engine "Frontenac" of 2,000 h. p. and two auxiliary engines of 600 and 900 h. p., also a 30-drill Rand air compressor and a pair of water-plunger air compressors with a combined capacity of 144 drills—the largest machines of this type ever constructed. South of the Hecla plant is the engine house known locally as the "G. H. & S.," from the initials of its three former engines, the "Gratiot," "Houghton" and "Seneca," of 2,000 h. p. each. The "Gratiot" was remodeled and removed to the stamp mills in 1902, and alterations made on the "Houghton" and "Seneca" enable them to do the work formerly requiring three engines. The Hecla boiler-house has 5 large boilers and a 200' smokestack of 9' 6" internal diameter.

The engine house operating Hecla shafts 7 and 8 contains the engines. "Hancock" and "Pewabic," each of 2,000 h. p., which operate 25' drums by spur gearing, and a 5,000 h. p. Leavitt engine for man-cars. A 50x120' boiler-house has 10 boilers and a 250' smokestack of 12' 6" internal diameter. The engine house serving shafts 9 and 10 South Hecla contains the engines "Detroit" and "Onota," of 1,000 h. p. each, and the engine house at shafts 11 and 12 has Lidgerwood hoists of similar capacity.

The Red Jacket shaft has a quadruple hoist of 8,000 h. p. in a 70x220' brownstone building, and in an adjoining brownstone building of 70x150', with 250' smoke-stack of 12' 6" inside diameter, are ten 1,000-h. p. boilers. At the rear of the engine house is a 32x412' brownstone annex, floored with cement and roofed with slate, in which is carried the fleet-gear. In raising ten-ton loads perpendicularly from a depth of one mile the weight of the cage and steel cable nearly equals that of the cargo of rock, but with the aid of counterbalance the engines can hoist ten-ton loads at a speed of 40 miles per hour, the regular hoisting time being about 90 seconds for the vertical distance of nearly a mile, this including time taken for starting and stopping, an achievement no locomotive could duplicate on a horizontal plane. The engine operates on the well-known Whiting system, devised by S. B. Whiting, formerly general manager of the company. To overcome the dangerous strain caused by unequal wearing, Walker differential rings were placed on the sheaves in 1903, with excellent results, the cables taking 4 complete turns round the driving sheaves. The steel combination shaft-rockhouse, 100' square and 110' high, is fitted with breakers capable of crushing 2,000 tons of rock daily.

The engine houses on the Osceola lode have steam and air connections and the Kearsarge shafts have air connections with the main power plants at the conglomerate shafts. No. 13 has a powerful permanent hoist, and similar hoists on the ground for shafts, 14 and 15 are to be removed to the new electric power plant at Lake Linden. Shafts 16 and 17 have temporary hoists only. Shafts 13, 14 and 15 have large stone engine-houses, while 16 and 17 have temporary engine-houses only. The Osceola shafts are supplied

with permanent shaft-rockhouses of the standard Calumet & Hecla size and equipment. No. 19 shaft on the Kearsarge lode has a hoist good for 2,500' depth, and is to have permanent stone buildings.

Among miscellaneous surface improvements is a 74x74' stone building housing the electric plant that furnishes light on surface and power to certain of the pumps underground. The company has a timber mill that mortises and tenons the bed-pieces, legs and stulls of the square sets used underground, a large paint shop, oilhouses, barns, etc., and a private telephone exchange with 100 instruments.

The Calumet & Hecla owns about 1,200 houses, occupied by employees at an average rental of 6% interest on actual cost, plus cost of maintenance, and upwards of 1,000 dwellings are owned by employees on lands leased from the company at low yearly rentals. The company also owns a large hotel and a fine stone clubhouse for employees, this containing bath-rooms, bowling alleys, etc. A free library of more than 16,000 volumes contains books printed in a score of languages, 30 different nationalities being represented on the company's payroll. There is also a combination library and clubhouse at Lake Linden, for the employees of the stamp mills and smelters. There are some 30 churches on Calumet & Hecla lands, occupied by a dozen different denominations, and for all these churches sites were donated, and in most cases substantial aid has been given in their erection and maintenance, entirely regardless of creed. There are also eight schools on the Calumet & Hecla lands, most of which were built by the corporation.

The company maintains a hospital, for employees solely, built in 1898 and noted for its complete surgical and laboratory apparatus. Nearly a dozen physicians on the hospital staff are at the call of any employee requiring medical or surgical attendance. In 1877 an aid fund was instituted for employees, and is managed by directors chosen by the workmen. This fund pays death and disability benefits, enormous sums having been disbursed since the formation of the fund, every dollar going to the sick and injured, or to families bereaved of their bread-winners by accident or disease. Surplus monies accumulated in this fund have been invested in the company's shares, bought on the open market, and these investments have been highly profitable. Disbursements from this fund are \$50,000 to \$75,000 yearly, and the nominal value of the fund at the end of the fiscal year 1904 was \$112,498, actual value being much greater, as all stock is inventoried at cost price. For the maintenance of this fund each employee pays 50 cents monthly and the company adds an equal amount. This is not called charity, but certainly is practical philanthropy of a noble sort.

Three systems of waterworks are maintained, two at Calumet and one at Lake Linden. One of the former furnishes water from dams for fire protection, and the other pumps potable water 4 miles from Lake Superior, against a head of 600', raising about 4,000,000 gallons daily. At the dam and mine there are 7 pumps, with a combined daily capacity of upwards of 45,000,000 gallons. The Lake Superior waterworks are to have electric power.

The company maintains a fire department, modeled on metropolitan lines, which affords protection to the mine buildings and location, and also

responds to calls from the town of 35,000 souls that has grown up about this great mine.

The stamp mills are located at Lake Linden, four miles from the mine, on a tract of about 988 acres, which has several miles of frontage on Torch Lake. There are two wooden mills, the "Calumet" and "Hecla," each of which originally had 11 Leavitt steam stamps, with cylinders $14 \times 21\frac{1}{2}$ " and 24" stroke. An addition to the southern end of the "Hecla" mill, completed in 1903, is $165 \times 308'$, of steel, built by the American Bridge Co. This has 6 stamps, each run by an independent 25-h. p. electric motor, the new mill being thoroughly modern and of great capacity. Among the new features are 7 Chilean re-grinding mills, in addition to the old Averley grinders, and enlarged finisher jigs. The new plant handles material with about 60% of the wash-water formerly required, thus effecting a double saving, inasmuch as all water used in the mills must first be pumped in, and thereafter raised as sludge in the sand-wheels when discharged.

Upon the completion of the "Hecla" addition, early in 1903, the work of rebuilding the old mills was begun. Each mill was divided into two sections, for rebuilding one at a time, the new "Hecla" addition but little more than taking the place of the sections under reconstruction. Each section requires a year for rebuilding, and the remodeling scarcely will be completed before 1907. While this work is called rebuilding, it is nothing short of building absolutely new mills on the site of the old, the work being done piecemeal because it cannot well be done otherwise. Notable features of the new construction are the replacing of wood with steel and cement throughout, the building of much heavier foundations and considerable additions to the wash-room below the stamps and coarse jigs. The rebuilding of the southern half of the old Calumet mill was completed in 1904. The new section, built by the Wisconsin Bridge & Iron Co., has a heavy steel frame, concrete foundations, cement floors, corrugated iron siding and a Carey roof of tarred burlap. The foundations are very massive piles, 20" apart, 2 and even 3 tiers having been driven to bed-rock and topped with $6 \times 12'$ timber and a $4' 6"$ bed of concrete. This section has 5 Leavitt stamps, Woodbury-Benedict jigs, 4-deck Evans-Rawlins slime tables, Chilean re-grinding mills, classifiers and Wilfley concentrators, the latter built in the Calumet & Hecla shops by special arrangement with the owners of the patents. The mills are to have 220 Wilfleys eventually, these effecting a considerable saving of very fine copper formerly lost, and greatly reducing the mill's water consumption. Work on the reconstruction of the second section of the Calumet mill was begun 1904, and will be completed May or June, 1905. The Robins belt conveyor in the Calumet mill is to be used for carrying barrel copper from the heads.

The mills contain 28 Leavitt heads, but owing to the rebuilding under way, only 22 to 23 heads are in place at one time, and allowing for the experimental work and heads temporarily out of commission, the average is about 18 effective stamps, which are treating an average of about 325 tons daily, each, of very refractory conglomerate rock, the new stamps exceeding and the old falling short of this duty. The remodeling of the Hecla mill in two

sections will require until the spring or summer of 1907. Each of the new heads has a jig attached direct, with about 5 jig classifiers, these doing all of the classifying. The wash portions of the rebuilt mills are to be operated by electric power. Two compounded heads, one of Leavitt, and one of Nordberg design, will be installed, side by side, and given full tests. President Agassiz states that the new mills will pay for themselves in one year's working.

Water for the mills is supplied by five pumps, of which the pumping engine "Michigan" is the most powerful in the world, having a daily capacity of 60,000,000 gallons. The daily capacity of the engines "Huron" and "Ontario" is 20,000,000 gallons each, of the "Erie" 10,000,000 gallons, and an I. P. Morris pump can raise 22,000,000 gallons daily.

As the mills stand on the flat western shore of Torch Lake, at little elevation above water-level, tailings speedily filled the shallow lake for some distance off shore, and to waste the sands it became necessary to secure a considerable initial elevation, which is gained by sand-wheels. The material entering the mills as conglomerate rock leaves as coarse sand, to the extent of nearly 6,000 tons daily. The sludge is washed through launders to the sand-houses, where it is scooped up by the buckets of the wheels and dumped high above into launders running on trestles far out into the lake, these spouting forth miniature Niagaras of brick-red color from their ends. There are two wheelhouses, one each for the Hecla and Calumet mills. The Calumet wheelhouse has sand-wheels of 40' and 50' diameter and the Hecla wheelhouse, caring for the sands from a much larger mill, has sand-wheels of 40', 50' and 64' diameter, the latter being housed in a three-story 65x78' steel annex 94' high. The old wheelhouses are of wood, iron sheathed. The steel in the new annex to the Hecla wheelhouse weighs 490 tons and the building is equipped with a 45-ton Sellers traveling crane. The 64' sand-wheel is to appearance a gigantic bicycle wheel, fitted with a spur gearing where the rubber tire should be. The complete wheel weighs 500 tons and is mounted upon massive concrete masonry. Four 25-ton iron bed-plates support the pillars carrying the 21-ton Krupp forged steel axle, which is 27' long and 32" in diameter with a hollow core of 26" diameter. Radiating from axle to rim are 2" steel spokes 32' long. The rim is in 20 segments weighing 10,700 lbs. each, the inner perimeter of the wheel having 550 buckets, in pairs, each 3' wide and 4' 6" long and holding 100 gallons, giving the wheel a capacity of 55,000 gallons per revolution. The completed wheel is 10' wide and 64' in diameter, driven by gear and pinion, power being furnished by a 700-h. p. dynamo. After all parts were delivered in 1902 nearly two years were required to build and adjust this monstrous wheel, which went into commission in 1904.

The electric plant for the mills is just west of the Hecla mill in a steel building 45x85' with wing of 45x60'. This has two engines, the "Saginaw" and "Gratiot," the latter connected with the generator by rope belting. The "Saginaw" is an Allis-Chalmers twin vertical tandem compound-expansion direct-connected engine having cylinders 17x40x48", with a speed of 95 revolutions per minute. Each engine drives a 1,000-kilowatt alternating current generator furnishing energy for the new Hecla sand-wheel, new Hecla mill, electric lights and sundry other uses.

The Calumet & Hecla has entered upon a plan calling for the almost complete electrification of its mines, mills and smelters. The plan will require several years for completion, and will involve an enormous outlay. Ultimately, electric power will be used throughout the property, except for certain big hoists and other compounded engines of high efficiency. The central power station will be at Lake Linden, where a 120' addition is being built to the present power plant. The advantage of this location is that coal can be delivered alongside from the largest vessels plying the great lakes, effecting a saving of about 10 cents per ton on transportation charges of coal now burned at the mines, and much more in the case of certain isolated plants, such as the waterworks plant on Lake Superior, which has no rail connection. There also will be the saving in slack resulting from one less handling of the coal. Some of the present steam installations consume as much as 4 lbs. coal per h. p. hour, whereas the new electric plant will require approximately $1\frac{1}{2}$ lbs. per h. p. hour. There are many other economies that will result—as for instance, in labor, the company now employing 100 firemen in its various power plants. The new electric plant probably will not be completed and in full operation before 1906. The annual coal consumption of the property now is about 225,000 tons, and the new plant will effect a very large saving in fuel and in operating costs. Two new 3,000-h. p. engines, at amygdaloid shafts 14 and 15, will be used for the new plant, these being the engines, Owego and Ontonagon.

Miscellaneous buildings at the millsite include a 50x100' steel combination boiler-house and smithy, machine shop, carpenter shop, paint shop, warehouse, etc. The boilers at the mill plant consume about 500,000 gallons of water daily, secured from a reservoir, artesian wells and Torch Lake. Trouble from impure water has been solved by the installation of a Jewell filtration plant of 500,000 gallons daily capacity, in which the impurities originally found in the water are precipitated by lime.

The tailings at the Lake Linden mills are the most extensive in the world, containing about 30,000,000 tons of stamp sand carrying from about 0.4% in the newest parts up to nearly or quite 1% copper in the older sections. The total amount of copper in these sands is probably almost 200,000 tons. Experiments at reworking have been made from time to time, without success. Between the included copper, which necessitates regrinding, and the oxidation of the metal, which is rapid, the problem of economical extraction is not simple, and yet lacks a solution.

The Calumet & Hecla has smelting plants at Lake Linden and Buffalo. The former works, opened 1887, now cover the major part of a 30-acre tract lying about a mile south of the mills. There are four furnace buildings, each 80x130', a 50x70' blister copper furnace building, warehouse, laboratory and assay office, machine shop, boiler-house and three mineral houses with a combined storage capacity of 18,000 tons. The mineral comes from the mills carrying nearly two-thirds metal to one-third gangue rock, instead of three-fourths metal, as some years ago, the dressing of mineral to a lower tenor in copper permitting the saving of much fine copper formerly lost in the slimes. Three reverberatory furnaces were rebuilt to 15 tons capacity each, in 1904, and the blister copper blast-furnace also was rebuilt. The Calumet

& Hecla now does custom smelting for the Mohawk and Wolverine mines. and the remarkable results secured have effectually refuted the idea, formerly prevalent in some quarters, that the Calumet & Hecla smelter was an old-fogy institution. The increased capacity has been found highly economical. The new reverberatories have 93' stacks and are top-charged, the mineral being thoroughly dried on platforms above the furnaces before charging. The largest blast furnace is 40x96" at the tuyeres. The eastern reduction plant, known as the Buffalo Smelting Works, is located on the Niagara River, at Black Rock, Buffalo, with deep water in front and direct rail connections in the yards. The Buffalo plant was established in pursuance of the company's policy of duplicating every vital part of the mine, mill and smelter, and has grown rapidly, now covering a considerable area. This plant also has a 30-ton electrolytic refinery for refining certain grades of mineral carrying considerable silver values. The Buffalo plant employs about 150 men.

Sufficient mineral is shipped during the season of lake navigation, April to November, to keep the Buffalo works supplied for the entire year. The highest grade mineral goes east for smelting, thus saving freight charges. The company operates a fleet of steel steamers and barges for carrying down mineral and bringing back soft coal, the fine steel steamer Geo. A. Flagg, of 3,300 tons register, being of this fleet. There is a series of very large coal sheds at Lake Linden, one of which has 200,000 tons capacity, the old sheds being of wood and the new of steel. There is also a series of docks at the mills and smelts on Torch Lake, all with substantial wharves having at least 21' of clear water alongside, frequent dredging being required to maintain this depth of clear water, owing to the stamp-sand filling in. The wharves were extended 1904, both at Lake Linden and Hubbell. The coal wharf has 11 Hunt hoists, and three 52' movable derricks, one of wood and two of iron. The Calumet & Hecla owns and operates the ship canal connecting Torch Lake with the government waterways on Portage Lake, this canal being 21' deep and accommodating the largest vessels plying the great lakes. Tolls ranging from 10 cents on soft coal to 50 cents per ton on package freight are charged on cargoes entering Torch Lake through the canal.

A sawmill, at the head of Torch Lake, receives logs by raft and ships sawed lumber and timber by a branch of the company's railroad. At the mouth of the Sheldrake river, on Whitefish Point, Chippewa county, Michigan, the company has a mill sawing about 12,000,000 feet of lumber yearly, with 8 to 10 years supply of standing timber tributary thereto. The company also has a mill at Ashland, Wisconsin, and owns extensive tracts of pine, hemlock and hardwood at various points along the southern shore of Lake Superior, in addition to which much timber is bought of jobbers.

Detailed annual statement of production and dividend payments will be found in the statistical chapter. The dividends of \$87,350,000, paid by the Calumet & Hecla to the close of 1904, are the largest ever disbursed by any mining corporation.

The statistical confusion so frequently noted in figures of Calumet & Hecla production is caused by the use of four sets of figures of production of refined copper, to say nothing of two sets of figures of output of crude mineral (unsmelted copper), and numerous estimates of more or less au-

thenticity. The four sets of official figures of annual production are for actual output of refined copper, and also quantity of fine copper contained in mineral produced, for the calendar year, and also for the company's fiscal year. Figures used in this publication are those of actual outputs in refined copper by calendar years. The mills treat about 5,750 tons of rock daily, securing therefrom an average of about 45 lbs. of fine copper per ton. The mineral, or crude copper from the mills, runs only 58% to 60% copper, a higher percentage meaning heavy losses in the flour copper that is saved now.

The cost per ton of rock stamped has been decreased from \$6.77 in the fiscal year 1900, to \$3.51 in the fiscal year 1903. Estimated cost of copper, for 1904, is about 7.5 cents per pound. Under the management of James MacNaughton, many and vast economies have been effected, without cutting wages or lopping off a single one of the many philanthropic enterprises for which the company so long has been noted. The Calumet & Hecla management speaks by acts rather than words, having no newspaper organs and feeling no need for any. As an employer, a business institution, and a money-making enterprise, it ranks with the greatest and best, and its magnificent past will be repeated in an equally magnificent future.

CALUMET, HECLA & SONORA MINING CO.

MEXICO.

Erroneous name given Calumet & Sonora Mining Co.

CALUMET MINING CO.

COLORADO.

Office: 2 Toltec Bldg., Denver, Colo. Letter returned unclaimed from former mine office, Rollinsville, Boulder Co., Colo. Emerson J. Short, president and general manager. Main shaft, 100', said to show a 2' pay-streak of auriferous and argentiferous chalcocite assaying 25% to 40% copper.

CALUMET MINING & MILLING CO.

WYOMING.

Mine office: Encampment, Carbon Co., Wyo. S. E. Phelps, secretary.

CALUMET & MONTANA DEVELOPMENT CO.

MONTANA.

Former office: Calumet, Mich. Dead.

CALUMET & ONTARIO DEVELOPMENT CO.

ONTARIO.

Office: Calumet, Mich. Mine office, Massey Station, Algoma, Ont. Lands are sundry copper claims near the Hermina mine.

CALUMET & PITTSBURG MINING CO.

ARIZONA.

Office: Calumet, Mich. Mine office: Bisbee, Cochise Co., Ariz. Organized December, 1903, under laws of Minnesota, with capitalization \$2,500,000, shares \$10 par, fully paid and nonassessable; issued, \$2,000,000. Annual meeting, second Monday in April. Succeeded the Calumet & Pittsburg Development Co. Chas. Briggs, president; James Hoatson, vice-president; Gordon R. Campbell, secretary; Peter Ruppe, treasurer; preceding officers, Thomas Hoatson, Thos. F. Cole, Chas. d'Autremont, Jr., and Geo. E. Tener, directors; Samuel A. Parnall, general manager. Employs 60 men. Company has same officers and local management as the Calumet & Arizona, with mainly the same shareholders, and is closely affiliated with that corporation.

Lands, 19 patented claims, area about 300 acres, in the Warren district, adjoining the Copper Queen, Calumet & Arizona, Lake Superior & Pittsburg and Junction Development Co. Cost of lands was \$937,451.75.

Development is by the Briggs shaft, about 3,000' south of the Junction

shaft and 3,000' southeast of the Lowell shaft of the Queen, both of which are drained by the Briggs shaft, which is 1,050' deep, and was cut down in 1904 to 4-compartment size, with one compartment 5x5', one 5x11' and two compartments 5'x4'6" each. Shaft has an 8" air line and two 12" water columns in the pipeway, with a steel gallows-frame on surface. At 910' the shaft cut seams of ore, and at the bottom shows seams of cupriferous manganese ore, similar to certain deposits of the Calumet & Arizona. The southeast drift at the 910' level shows 600' of leached ore and soft material, and cut the tops of 3 ore bodies of 5' to 17' width, carrying 10% to 20% ore. A 200' diamond drill hole has penetrated considerable high-grade ore. The Briggs shaft is exceedingly wet, draining a large part of the Bisbee camp, and has 3 pumps, of which 2 are Prescotts, with combined capacity of 2,500 gallons per minute, at a steam pressure of 150 lbs. per inch, working against a head of 1,500'. The Briggs shaft is to be connected with the Junction shaft for ventilation.

A new shaft is said to have been decided on for the Del Norte claim. This would be about 2,500' from the Briggs shaft, and practically certain to find ore, as the Lowell developments are very favorable up almost to the boundary line. The Junction shaft is on the boundary line of the Calumet & Pittsburg, sunk with a view to permitting extraction from both properties.

The power plant at the Briggs shaft has 7 boilers of which 4 are of 250-h.p. each. Petroleum is used for fuel. Geological conditions and developments at surrounding properties are such as to predicate the existence of large ore bodies at slightly greater depth than has been reached. Company's treasury probably is running low, and must be replenished soon, especially in view of the very heavy pumping charges.

CALUMET & SAULT STE MARIE DEVELOPMENT CO. ONTARIO.

Office: Calumet, Mich. Mine office: Massey Station, Algoma, Ont. Fred Roehm, president; Wm. F. Ashton, superintendent. Has a 100' main shaft said to show a 14' vein carrying auriferous chalcopyrite.

CALUMET & SONORA MINING CO. MEXICO.

Office: 610 First Natl. Bank Bldg., Duluth, Minn. Mine office: La Cananea, Sonora, Mex. Organized under laws of Minnesota, with capitalization \$300,000, shares \$10 par. Marcus L. Fay, president and general manager; Walter J. Power, vice-president; Hubert V. Eva, secretary; Louis P. Swanstrom, assistant manager; James A. Dougherty, superintendent. Lands, 70 pertenencias, area 173 acres, in 3 adjoining groups, nearest about 5 miles from La Cananea. Country rocks are mainly limestone and porphyry, with good copper outcrops, opened by 4 shallow shafts. Main shaft shows some good ore, but is proving very wet. Officers are men of excellent standing.

CALUMET & TEXAS MINING CO. TEXAS.

Office: Cedar Rapids, Iowa. Mine office: Carlsbad, N. M. Employs 10 men. Organized May, 1901, under laws of New Mexico, with capitalization \$250,000, shares \$1 par. John H. Shary, president and general manager; Wm. Fullerton, secretary; Alfred C. Sieboth, consulting engineer. Lands, 36 claims, area 720 acres, also 640 acres of oil lands, in the Guadalupe mountains, El Paso county, Texas, showing an ore body giving assays of 20% copper, 5% lead and 1 oz. silver per ton, with a trace of gold, from carbonate

ores opened by tunnels of 40', 200', 210' and 328'. Nearest railroad, the Pecos Valley & Northeastern, is 64 miles distant. Test shipments of 23 tons of ore to El Paso smelter gave returns of 19% to 24% copper.

CALUMET & WESTERN DEVELOPMENT & MINING CO.

Office: care of F. S. Carlton, president, Calumet, Mich. John Daniell, secretary; W. B. Anderson, treasurer. Organized 1903, under laws of Arizona, with capitalization \$6,000,000, shares \$1 par, in 100,000 shares of 7% preferred stock and 500,000 shares of common stock. Company is an exploratory, development, promotion, and investment corporation, planned to operate in any section of the United States, Canada or Mexico. Present holdings include the Globe zinc mine, near Joplin, Missouri.

CALUMET & YAQUI RIVER COPPER CO.

MEXICO.

Office: La Cananea, Sonora, Mex. Organized May, 1903, under laws of Arizona, with capitalization \$3,000,000, shares \$10 par.

MINA CAL VERDE.

MEXICO.

Office: care of Chas. A. Green, owner, Houghton, Mich. Lands, 17 pertenencias, in the Sierra de las Arrados, district of Bravos, Chihuahua, Mexico, showing limestone impregnated with copper stains, carbonates and oxides, traversed by a porphyry dike and having a heavy iron capping. Idle.

CAMBRIAN CONSOLIDATED MINES, LTD.

WALES.

Offices: Moorgate Station Chambers, London, E. C., Eng. Mine office: Dolgelly, North Wales. Organized Nov. 14, 1900, with capitalization £30,000, par £1; issued, £26,667. H. Rosenway, chairman; P. C. Guy, secretary; E. G. Woodford, consulting engineer. Lands, 4,000 acres, carrying gold, silver and copper, on which a little development has been secured.

CAMBRIAN COPPER MINING CO., LTD.

WALES.

Liquidated voluntarily, 1903.

CAMBRIAN MINING & MILLING CO.

CALIFORNIA.

Mine office: Placerville, El Dorado Co., Cal. F. Thomas, president; Leonard Thomas, general manager; D. R. Roberts, superintendent. Mine has 3 parallel veins, averaging 6' to 8' width, with gangue of talcose schist and lime, between diorite and serpentine, showing cuprite, malachite and sulphide ores, with native copper in the alteration zone, ores carrying 8% to 16% copper and good gold values. Mine has considerable underground development.

CAMBRIDGE COPPER MINING CO.

NORTH CAROLINA.

Formerly operated a mine near Jamestown, Guilford Co., N. C. Dead.

CAMERON MINES.

ARIZONA.

Now owned by Canyon Copper Co.

CAMP BIRD EXTENSION MINING CO.

COLORADO.

Office: Boston Bldg., Denver, Colo. Mine office: Ouray, Ouray Co., Colo. M. L. Thistle, superintendent. Ores carry gold, silver, lead and copper. Has water and electric power.

SOCIEDAD ANONIMA COBRES DE CAMPOO.

SPAIN.

Office: Santander, Spain. Mine office: De Soto, Santander, Spain. Don Alberto Gutiérrez, president; Don Luis Torres Quevedo, secretary. Property is a group of copper mines, idle at last accounts.

CAMP VERA GROUP.

CALIFORNIA.

Lands are in the Morrow district of San Bernardino county, California.

Letter addressed to J. W. Rodgers, owner, Barstow, Cal., returned unclaimed.
MINAS DE CAMPANARIO. SPAIN.

Office: care of Don Antonio Guijarro Orta, Huelva, Spain. Mine office: Valverde del Camino, Huelva, Spain. Property is a group of 6 properties, area 87 hectares, on which iron-copper sulphides are being developed.
CAMPRODEN COPPER SYNDICATE, LTD. SPAIN.

Offices: 3, Lord St., Liverpool, Eng. Apparently moribund.
CANADIAN COPPER CO. ONTARIO.

Office: 12 Wade Bldg., Cleveland, Ohio. Mine office: Sudbury, Algoma, Ont. This is the world's largest producer of nickel, and is controlled by the International Nickel Co., through ownership of nearly the entire stock issue. A. P. Turner, general manager. The property was discovered in 1882 and opened in 1886. Lands are extensive and include the Creighton mine, worked open-cast, now the largest producer, Stobie mine in Blezard Twp., 4 miles north of Sudbury, the Evans, McArthur 1 and 2, McDonald, Clara Belle A and B, and other mines, in addition to the older and principal workings at Copper Cliff, the Copper Cliff mine being opened to the 14th level, presumably circa 1,400'. Ore is nickeliferous chalcopyrite with pyrrhotite gangue occurring as irregular lenses in basic igneous rocks, mainly greenstone and diorite. Ore is heap-roasted at the Copper Cliff mine and matted at the Sudbury smelter, 3 miles distant. The roast-heaps contain 4,000 to 5,000 tons each, roasting requiring three or four months. Latterly a considerable proportion of green ore is mixed with the roasted ore in smelter charges. The product of first fusion is a matte of 30% to 35% tenor in combined nickel and copper, the second fusion giving an 80% matte, which is shipped to the Orford works at Constable Hook, N. J., and smelted with sulphide of soda, by which the separation of the nickel and copper is effected, the resultant copper product being refined electrolytically. The ore gives average returns of about 2.75% copper and 2.5 nickel.

Construction of a new smelter was begun at Copper Cliff Apr. 20, 1903, but the new plant was partly burned Feb. 19, 1904, after which the Mond smelter at the Victoria mines was used until rebuilding of the partly completed new plant. The new smelter, of brick and steel throughout, has storage bins of 2,000 tons capacity, material being handled from mines to smelter and at the latter by two 80-ton locomotives hauling 50-ton drop-bottom dump-cars. The new smelter has two furnaces of 500 tons capacity and a converter plant, power being almost exclusively electric, generated by a central steam plant, soon to be replaced by electricity from water power. The Huronian Company, a subsidiary corporation, is completing a powerful electric installation at High Falls, on the Spanish river, 4 miles north of the Canadian Pacific Railway, with dams estimated to impound water sufficient to generate 11,000 horse power, eventually to be doubled.

In smelting, the company's new plant has taken many ideas from the Tennessee Copper Co. and the Mond Nickel Co. The use of mixed charges of raw and roasted ore is a modification of the new Tennessee process, while the Mond process will be utilized in bessemerizing the matte carrying about 80% of combined nickel and copper.

The operations of the company in 1904 were hampered by scarcity of

labor, as well as by the burning of the smelter. The average annual production of the Canadian Copper Co. has been 5,000,000 to 7,000,000 lbs. refined copper, and 3,500,000 to 6,000,000 lbs. refined nickel for several years past, but should be materially greater during 1905.

CANADIAN MINING & DEVELOPMENT CO.

MONTANA.

Letter returned unclaimed from former mine office, Basin, Jefferson Co., Mont. Lands, 10 claims, showing shipping gold, silver, lead and copper ores.

CANADIAN-AMERICAN MINING CO.

BRITISH COLUMBIA.

Lands, on Gribble Island, off the coast of British Columbia.

CANADIAN SMELTING WORKS.

BRITISH COLUMBIA.

Office and works: Trail, B. C. Owned and operated by the Canadian Pacific Railway. Is the largest lead-copper reduction plant in Canada, with daily capacity of 1,200 tons and employs 350 men. W. H. Aldridge, general manager; J. Labarth, superintendent. Is operated by electrical power brought about 30 miles, from the Kootenay river. Line current is 20,000 volts, stepped down to 550 volts at the smelter, giving a total of 1,000 h. p., in motors divided into 16 units. Smelter treats custom ores exclusively, brought from all parts of British Columbia, but principally from the Roesland district. Plant includes a 100-ton Gates crusher, 3 Vezin automatic samplers, Jones riffle sampler, 24 roast stalls, 19 calciners and three 300-ton copper furnaces, with automatic feed. Ore and fluxes are handled in hopper cars, drawn by 10-h. p. electric locomotives. The first matte contains 10% to 12% copper only, which is granulated and roasted in two O'Harris furnaces, after which the calcined matte is briquetted and resmelted, averaging 50% in tenor. Works include a very complete lead-smelting plant, handling silver-lead-zinc ores, and including an experimental electrolytic lead-refinery. In 1904 these works treated 163,865 tons of ore, of which 131,130 tons came from the Roesland district, and 4,800 tons were from the United States. Production was 2,675 tons of gold-copper matte and 6,382 tons of silver-lead bullion. Matte was converted to blister copper at the Tacoma Smelting Works and at the Greenwood works of the British Columbia Copper Co. Management is excellent and plant is fully up to date.

CANANEA CONSOLIDATED COPPER CO., S. A.

MEXICO.

This company, incorporated under Mexican laws, holds direct title to the mines of the Greene Consolidated Copper Co., the Greene company owning the entire stock issue of the Cananea Consolidated.

MINA CANDELA.

MEXICO.

A property in the state of Michoacan, Mexico, the owners of which are said to be opening a large body of low-grade sulphide ore in a deliberate manner. Local conditions supposed to be much the same as at the Inguaran.

MINA CANDELARIA.

MEXICO.

Mine office: Chacala, Durango, Mex. Owned and managed by P. G. Dismukes, T. L. Dismukes and J. S. Wilkinson. Ores are bismuthiferous and carry gold, silver and copper. Has steam power, Bryan mill and 6-ton chlorination plant.

CANDELARIA MINING CO.

MEXICO.

Office: care of Edwin D. Morgan, president, 100 Broadway, New York. Mine office: San Pedro, Chihuahua, Mex. Britton Davis, general manager;

David B. Smith, superintendent. Is the principal mining company of northern Chihuahua, employing about 1,200 men. Lands, circa 1,700 pertenencias, area approximately 4,200 acres, also sundry grazing and miscellaneous lands, the mine tract being about $\frac{3}{4}$ mile wide by 5 miles long. Principal development is on the northern portion of mine tract, with the 700' San Pedro shaft, 700' Candelaria shaft, 600' San Nicolas shaft and 500' Congreso shaft. Sundry other mines, including the Cobriza, have shafts of 175' to 350' depth, the company's mines having a total of about 3,200' of shaft development, with about 25,000' of underground openings all told.

Country rocks are porphyry, diorite and limestone, ore bodies being somewhat erratic. The San Pedro is the oldest mine and has produced the highest grade ore. The Candelaria is now the largest and steadiest producer of high-grade ore, shipping selected ore of first grade giving average smelter returns of approximately 20% lead, 8% copper, 10% zinc, 400 oz. silver and 0.5 oz. gold per ton. The San Nicolas produces silver-lead and copper, latter as chalcopryite. The Congreso mines mainly lead carbonates. The company formerly operated a copper matting furnace at the mines, hauling coke therefor 90 miles in wagons from Villa Ahumada on the Mexican Central Railway, but later a railroad was built to Juárez, opposite El Paso, where a reduction plant, including concentrator and smelter, was built. This plant was sold to the Guggenheims, and Candelaria ores now are treated at the Aguascalientes works of the American Smelting & Refining Co. The Candelaria, which is a dividend-payer, has an excellent management, both locally and in the east.

CANDELARIA MINING & EXPLORATION CO.

MEXICO.

Office: Colorado Springs, Colo. Mine office: Parral, Chihuahua, Mex. H. L. Browne, superintendent. Ores carry gold, silver, lead and copper. Main shaft, 150', also a 175' tunnel. Has steam power, 5-stamp mill and 25-ton cyanide plant. Property thought to be valuable, but idle.

CANTON COPPER MINE.

GEORGIA.

An old and idle property in Fannin county, Georgia. Main shaft, about 300'. Ores occur as chalcopryite impregnations in micaceous schist.

CANYON COPPER CO.

ARIZONA.

Office and mine: Grandview, Coconino Co., Ariz. Jno. H. Page, president and general manager; H. H. Smith, secretary and treasurer; John Curran, mine superintendent. Organized 1902, under laws of Arizona, with capitalization \$600,000, shares \$10 par; unissued, \$504,920. Lands, 10 claims, area 200 acres, also 10-acre millsite, in the Grand Canyon of the Colorado river. Veins are contacts between limestone and porphyry, giving average assays of about 30% copper, from cuprite, melaconite, malachite, azurite and chalcopryite. Property, discovered 1892, was bought by present owners from the Last Chance Mining Co., 1902. Produced about 350,000 pounds of copper in 1904, from about 550 tons of ore smelted. Property apparently is of considerable promise.

CANYON GOLD & COPPER CO.

MONTANA.

Office: Helena, Mont. Canol & Martin, managers; A. W. Martin, superintendent. Property is in the vicinity of Canyon Ferry, Lewis & Clarke county, Montana, and is a small shipper of smelting ore averaging about 22% copper, with fair gold values.

MINA CANZA.**PERU.**

Office and mine: care of A. Garland y Ca, owners, Canza, Ica, Peru. An old property and once a considerable producer. Numerous cupriferous veins in igneous rocks carry bodies of ore that are oxides and carbonates above and sulphides below the water level. Has 3 principal veins, opened to depth of 700' on the Adelaide; 1,000' on the Consolador and 500' on the Tapadita, the latter having been the largest producer in the past.

CAP SHEAF COPPER & GOLD CO.**BRITISH COLUMBIA.**

Said to have copper prospects on Texada Island, British Columbia.

SOCIETE DELLE CAPANNE VECCHIE E**ITALY.****POGGIO BINDO.**

Mine office: Massa Maritima, Grosseto, Italy. Property is sundry ancient mines, reopened in 1846, since which time they have been small but steady producers. Principal vein is 6" to 50' wide, ore being mainly chalcopyrite, which is sorted into two grades, the first grade of 11% average tenor being smelted, while the second grade, carrying about 3% copper only, is heap-roasted and leached.

CAPE BRETON COPPER CO., LTD.**NOVA SCOTIA.**

Office: 53 State St., Boston, Mass. Mine office: Coxheath, Cape Breton Co., N. S. Capitalization \$2,000,000. John C. Watson, president; Isaac P. Gragg, secretary; J. Dorr, treasurer. Property is the old Coxheath mine and adjoining lands, 10 miles from Sidney, Cape Breton, showing several cupriferous veins, of which the principal one, averaging 10' width, traverses felsite and diorite, carrying argentiferous and auriferous chalcopyrite in a silicious gangue, ore averaging about 4.5% copper. Company said to have reopening of mines under consideration.

CAPE COPPER CO., LTD. CAPE COLONY, NEWFOUNDLAND & NORWAY.

Offices: 9, Queen St. Place, London, E. C., Eng. Mine offices: O'okiep, Little Namaqualand, Cape Colony, and Tilt Cove, Newfoundland. Edmund A. Pontifex, chairman; John Taylor & Sons, managers; Compagnie Francaise des Mines d'Or et de l'Afrique de Sud, 20, Rue Taitbout, Paris, French agents; Percy John Frank, secretary; J. L. Dean, mine manager in South Africa. Organized, April 30, 1888, as a reconstruction of the Cape Copper Mining Co., organized 1863, with capitalization £750,000, in £150,000 of 6% cumulative £2 preference shares and £600,000 in £2 ordinary shares; issued, £690,000. Dividend payments in 1901 were £224,250; in 1902 there was a net loss of £6,494, and in 1903 a net profit of £95,979 and in 1904 a net profit of £183,795. Dividends were 13s. in 1901, 5s. in 1903 and 8s. 6d. in 1904. Annual accounts are made up to April 30 at the Cape, and to Aug. 31 in London, and submitted in December. Separate accounts are kept for the Tilt Cove property in Newfoundland, which is held on a 99-year lease expiring 1989, at an annual rental of £4,400, plus one-half of net profits. The East mines of the Tilt Cove produce sulphide ores averaging 3% to 3.5% copper with small gold and silver values, while the West mines have much smaller ore bodies, averaging about 11% copper. Company also is interested in sundry Norwegian mines and is entitled to one-half of net profits of the Briton Ferry Chemical & Manure Co., Ltd., which takes the sulphurous gases given off by the smelters of the company's works at Briton Ferry, England.

Principal mines of the company in South Africa are the O'okiep, NababEEP, Narrap and Spektakel. The O'okiep and Spektakel were opened in 1852, and the former remains the principal producer, but its ore reserves are growing smaller yearly, foreboding the eventual exhaustion of the mine. The NababEEP, opened circa 1890, produces about 7% ore. The Narrap is a comparatively new property. Ore is matted at the O'okiep smelter to a tenor of about 48% and shipped to England via Port Nolloth. The mine smelter is thoroughly modern in equipment, but lacks converters. The Namaqualand ore bodies are irregular massive deposits of copper and iron pyrites, associated with basic igneous intrusions in the granite and gneiss country rocks. At the Spektakel ore occurs in both the granitic and basic intrusive rocks, while at the NababEEP the ores are intimately mixed with the greenstone, appearing as bunches and veins in the richer portions only. Ore is mainly chalcopyrite, with some bornite and chalcocite, intimately associated with iron pyrites and showing occasional cuprite and melaconite, while a little malachite, azurite and chrysocolla occur near surface, the average of the O'okiep ores being very high, while the NababEEP averages about 5% copper only. Production of fine copper for the fiscal year 1904, was 2,081 long tons greater than in the preceding year. Production of fine copper for year 1904 was 7,675 gross tons, of which the O'okiep made 2,904 tons, the NababEEP 2,571 tons, and the Tilt Cove mines 2,200 tons. This company is an old and important producer, and is managed with great prudence.

CAPE D'OR COPPER DEVELOPMENT CO.

NOVA SCOTIA.

Mine office: Cape D'Or, Cumberland county, Nova Scotia.

CAPILLITAS COPPER CO., LTD.

ARGENTINA.

Offices: 6, Princes St., London, E. C., Eng. Mine office: Cerro de Capillitas, Tucuman, Argentina; Works office: Pilciao, Catamarca, Argentina. Geo. Grinnell-Milne, chairman; Nicol Brown, vice-chairman; J. G. Tait, secretary; J. S. MacArthur, consulting, engineer; A. Stark, mine manager. Organized Nov. 25, 1901, with capitalization, £600,000, shares £1 par, in £150,000 cumulative 7% preference shares, £150,000 cumulative 7% ordinary shares and £300,000 deferred shares; issued, £555,000. Lands are extensive, including the Capillitas and Atajo groups of mines and the Pilciao and Constancia smelters, bought for £95,000. Company also has sundry lands fairly timbered. The Capillitas group of about 20 properties, district of Andalgalá, in the eastern part of the province of Catamarca, shows 12 veins. Principal developments by the former owners were on the Restauradora, Rosalia, Carmelita, La Grande and Ortiz mines. These are being reopened by two tunnels under the old workings at La Grande, and by one new tunnel in the Restauradora. Ore from development work has averaged about 15% copper, with good gold and silver values, being bunchy as a rule, but very high in grade. The Atajo mines are about 30 miles from the Capillitas, and have a smelter with 6 small reverberatory furnaces.

These mines are much the most important in Argentina, and have been worked irregularly by local capital since about 1850. One of the principal difficulties in operation has been defective means of transport, as the mines are located in exceedingly rugged mountains, necessitating the shipment of

ore to smelters by packmules. The mines are 8,000' above sea-level and more than 6,000' above the temporary smelters and shops at Pilciao. The nearest railroad station is Chumbicha, 165 kilometres distant over exceedingly rough and dusty roads. A traction engine was tried, but stuck in the sand. The government has promised to extend the Córdoba Central railroad to Andalgala. To cover the worst stretch between the mines and smelters a single-line aerial tram has been ordered. This will be 22 miles in length, and the longest span is to be 2,765', and in crossing one valley the cable will swing 625' above the ground. The plant weighs 2,000 tons, and is made in sections for convenient packing on muleback. This tramway is designed to carry 40 tons of ore hourly, at a speed of 2.5 metres per second, cars being of 500 kilos capacity. The tram will leave a 20-mile gap between Pilciao and Muschaca, but the permanent smelter, with two 50-ton water jacket blast furnaces, is being erected at Muschaca Quebrada, where there is plenty of room and water. About 225 h. p. will be generated from the Rio Andalgala, and transmitted to the new smelter site electrically. The old Constancia smelters, with 2 reverberatory furnaces, have been overhauled, and in 1903 shipped 61 tons of matte averaging 62% copper, 60 oz. silver and 2 oz. gold per ton. Ores smelted by present company have averaged about 23% copper, 20 oz. silver and 15 dwts. gold per ton, but the grade undoubtedly will decrease with regular production. A considerable force is employed and development is along systematic and adequate lines. The property is one of great promise, and the management is well regarded.

CARAHYBA COPPER MINING CO.**BRAZIL.**

Mine office: Alagoinhas, Bahia, Brazil.

CARBON COUNTY GOLD MINING & MILLING CO.**WYOMING.**

Mine office: Morgan, Carbon Co., Wyo. W. R. West, superintendent. Ores carry gold, silver, lead and copper. Has steam power and 10-stamp mill.

CARBONATE & LAURA MINES.**COLORADO.**

Mine office: care of Hoffman Bros., owners, Crystal, Gunnison Co., Colo. Have gold-silver ores, carrying a little copper. Have water power.

CARDENAS COPPER CO.**ARIZONA.**

Absorbed by the Anita Consolidated Copper Company of Arizona.

MINAS CARDENILLO y EL ARMADILLO.**MEXICO.**

Mine office: Tuxpan, Tepic, Mexico. Fernando Diaz, owner; A. C. Gonzales, manager. Produce silver-copper ores. Have steam power and employ 50 to 100 men.

CARIBOU GOLD & COPPER CO.**IDAHO.**

Office: care of Frank A. Putnam, Gray, Idaho. Organized September, 1903, with capitalization \$2,500,000, shares \$10 par, to develop claims 65 miles southeast of Idaho Falls, in Bingham county, Idaho. Said to have an 8' vein, traceable 3,000'.

CARIDAD COPPER MINING CO., LTD.**SPAIN.**

Offices: 20-21, Lawrence Lane, London, E. C., Eng. Mine office: Lozoyuela, Madrid, Spain. Robert Summerside Simpson, chairman; Geo. Thompson, secretary; R. T. Swallow, mine manager. Organized, Feb. 15, 1899;

capitalization increased, 1901, to £350,000, shares £1 par; issued, £75,492. Lands, 84 hectareas, including the Caridad, San Antonio and Descuido mines. Idle at last accounts.

MINA CARIDAD.**SPAIN.**

Office: care of Don Carlos Lacone, agent, Sevilla, Spain. Is developing fair-sized bodies of chalcopyrite and iron pyrites.

CARISA COPPER & GOLD MINING CO.**UTAH.**

Office: Salt Lake City, Utah. Mine office: Mammoth, Juab Co., Utah. J. E. Gallagher, president; H. S. Joseph, vice-president and general manager; Geo. Norman, superintendent. Organized August, 1901, under laws of Utah, with capitalization \$500,000, shares \$1 par. Paid dividends of \$30,000 in 1902. Lands, 7 patented claims, area 60 acres, in the Tintic district, showing 10 fissure veins in limestone, of which 3 are more or less developed, these giving returns up to 12% copper, 5 oz. silver and \$1 gold per ton. The Carisa shaft is 250' deep and the Spy shaft 800', and the mine has tunnels of 800' and 8,000', with about 5 miles of underground openings. Has steam power and employs about 40 men, in addition to which portions of the mine are worked on lease. Production of refined copper in 1904, supposed to have been about 900,000 lbs., as against 660,000 lbs., in 1903. Property is energetically managed and new ore bodies of considerable size and high grade are being developed.

CARLISLE COPPER CO.**MONTANA.**

Letter returned unclaimed from former mine office, Butte, Silver Bow Co., Mont. Organized as successor to the Butte-Anaconda company, which did some development on the Carlisle mine in East Butte.

CARMACK GOLD & COPPER MINING CO.**WASHINGTON.**

Office: Arcade Bldg., Seattle, Wash. Mine office: North Bend, King Co., Wash. Organized 1899, with capitalization \$500,000, shares 25c par. G. W. Carmack, president; L. O. Lane, secretary. Lands, 5 claims, on the south fork of Snoqualmie river, 22 miles northeast of North Bend. Has 375' of openings, showing veins of 12", 30" and 12', giving fair assay values in gold, silver, lead and copper.

MINAS DE CARMEN.**CHILE.**

Mine office: Carmen, Chañaral, Atacama, Chile. Simon Baldovieso, owner; Adriano Fernandez, manager. Lands, 15 pertenencias, area 36 hectareas, including the Carmen, Carmela, Cardúmen, Mina Nueva, Araucana, Quíñazo Locura, Lautaro and other mines, showing two main veins, the Veta Manto ranging 4 to 12 metres in width, while the minor vein is 2 to 3 metres wide. Ores, in successive lenses along the veins, are oxides, carbonates and silicates at and near surface, disseminated throughout the ferruginous gangue of the lenses. The Carmen mine shows an abundance of native copper at an approximate vertical depth of 200'. The sulphide zone, reached at a vertical depth of about 110 metres, shows rich altered sulphides, below which the ore is chalcopyrite, associated with arsenical pyrites, disseminated in iron pyrites. The Carmen, the principal producer of the group, is opened by 2 shafts 190 metres apart, sunk at an angle of 45° on the vein, one being 85 metres and the other 190 metres in depth, both shafts being connected by the extensive underground workings. The other mines are

opened by various shafts, several having underground connections with the Carmen. The mines show reserves of about 75,000 tons of ore, ranging from 6% to 15% in copper tenor. Mine has good steam power plant, and employs about 100 men. Production since 1895 has averaged about 6,000 tons of ore, averaging 10% copper, equal to about 1,325,000 lbs. refined copper yearly and by reason of the new plant, should be considerably increased for the future.

MINAS EL CARMEN AMPLICION.

MEXICO.

Mine office: Cerralvo, Nuevo León, Mex. Marciano E. Villaneal, owner and manager. Ores are argentiferous copper and lead sulphides. Employ about 40 men.

CARMEN COPPER MINES, LTD.

CHILE.

Offices: St. George's House, Eastcheap, London, E. C., Eng. Mine office: Cerro Blanco, Copiapó, Chile. Alfred Hambley Rowe, chairman; John Pye, secretary. Organized June 28, 1900, with capitalization, £125,000, shares £1 par.; issued, £75,307. Absorbed the Newfoundland Copper Co., Ltd., in 1901, thereby securing title to the Little Bay and Lady Pond copper mines in Newfoundland, now idle. Chilean property includes the Perseverancia mine, at Guanaco, Taltal, the Carmen Bajo, in the Copiapó district, the Bella Vista, Aguardos and other mines in the Coquimbo district. Copiapó properties are idle, but work is in progress in a small way on the other properties.

CARNARVON ASSOCIATED GOLD & COPPER MINES, LTD.

Registered (Guernsey) Jan. 31, 1903, with capitalization £10,000, shares 10s. par.

CARN BREA & TINCROFT MINES, LTD.

ENGLAND.

Office: Carn Brea, R. S. O., Cornwall, England. Frank Harvey, J. P., chairman; T. Forster Brown, consulting engineer; John Trevethan, secretary; W. T. White, mine manager. Organized May 24, 1900, with capitalization £150,000, shares £1 par.; issued, £127,848. Property is tin and copper mines at Redruth, Cornwall, formerly making nearly 1,000 tons of copper yearly, but present annual production averages about 30,000 lbs. only.

GEORGE E. CARNE y OTRO.

CHILE.

Own the Buena Vista mine, in the department of Tocopilla, Chile. Property opened 1880; idle at last accounts.

CARNEY MINING CO.

MICHIGAN.

Office: Norway, Mich. Mine office: Carney, Menominee Co., Mich. Organized 1904, under laws of Michigan, with capitalization \$25,000. J. A. Carlson, president; J. E. Blomgren, secretary. Has an 88' shaft, showing ore at bottom assaying 1% to 3.24% copper.

CAROLINA COPPER CO.

NORTH CAROLINA.

Office: 15 Atwater St., West, Detroit, Mich. Mine office: Cullowhee, Jackson county, N. C. Idle. Organized 1901, under laws of Michigan, with capitalization \$2,500,000, shares \$25 par, fully paid. Lewis C. Waldo, president, treasurer and general manager; Thomas A. Cox, vice-president; Hugh M. McCormick, secretary and business manager; John Torel, mining engineer. Lands, 1,500 acres, showing four fissure veins, said to be of 27" average width, carrying estimated average values of 3% copper, 4 oz. silver

and \$1 gold, ores being mainly sulphide. Property is the old Wayehutta mine, opened 1854; closed 1861, developed by a 55' shaft and 200' tunnel.

CAROLINA GOLD & COPPER CO.**NORTH CAROLINA.**

Office: Salisbury, N. C. Mine offices: New London, Stanley Co., N. C., and Gap Creek, Ashe Co., N. C. Employs 10 men. Organized, circa 1900, under laws of Arizona, with capitalization \$2,500,000, shares \$1 par. M. H. Caldwell, president; Edwin C. Gregorie, secretary; Richard Eames, Jr., treasurer and general manager. Lands, 350 acres, including the Parker mine, at New London, ores of which average 7% copper and 5% gold per ton, from sulphide ores, with quartz gangue. Has steam power and a 5-ton 5-stamp mill, employing 10 men.

CAROLINA KING MINING CO.**NORTH CAROLINA.**

Mine office: Virgilina, Va., Organized 1903, to take over property of the Copper World Mining Co., and the Danville & Virginia Copper Mining Co. Copper World has two shafts, deepest 100', in a vein of fair width, showing chalcocite, also carbonate and oxide ores, assaying 15% to 65% copper.

CARP LAKE MINING CO.**MICHIGAN.**

Office: care of H. L. Payne, general manager, Cleveland, Ohio. Lands, 1,087 acres. Work was begun in 1858. Is opened by shafts and adits. Main adit 1,250'. Had a 20-stamp gravity mill at one time. Lode is about 7' wide. Fully described in Vol. II.

MINAS EL CARPIO.**SPAIN.**

Mine office: Cortegana, Huelva, Spain. Area, 73 hectares. Have 11 old shafts. Ore, cupriferous pyrites. Property was under development by a French exploration company at last accounts.

CARR MINE & COLORADO CO., LTD.**COLORADO.**

Offices: 18, Leadenhall St., London, E. C., Eng. Mine office: Central City, Gilpin Co., Colo. Geo. Paget Walford, chairman; Walter J. Webb, secretary; Stephen Hosking, manager. Capital, nominal, £150,000. Ores carry gold, silver and copper. Has steam and electric power and a stamp mill.

SOCIEDAD ANONIMA MINAS DE CARRACEDO.**SPAIN.**

Office: Bilbao, Spain. Mine office: Vañes, Palencia, Spain. Property was undergoing development at last accounts.

CARRANZA-LAFONE COPPER MINING &**ARGENTINA.****SMELTING CORPORATION, LTD.**

Offices: 86, Leadenhall St., London, E. C., Eng. E. Learoyd, secretary. Organized to secure mines, build a modern smelter and develop electric power in the Capillitas district, Rioja, Argentina. Apparently moribund.

CARRERAS HERMANOS.**BOLIVIA.**

Office and mine: Coro Coro, La Paz, Bolivia. Mine is opened on two successive strata of cupriferous conglomerates; see article on Bolivia for details. Production, about 400 tons of 75% copper mineral yearly. Only native copper is mined, and the product, as barillas de cobre, is shipped through Mollendo, Peru, for refining. Employs 150 to 200 men.

CARIBBEAN MINING CO.**COLORADO.**

Office: Holyoke, Mass. Mine office: Ophir, San Miguel Co., Colo. Chas. E. Newton, superintendent. Ores carry gold, silver, lead and copper. Has water power and 20-stamp mill

SOCIEDAD DE MINAS y FUNDICIONES DE CARRIZAL. CHILE.

Offices: 1, Laurence Pountney Hill, London, E. C., Eng., and Catedral 2489, Santiago de Chile. Mine office: Carrizal, Copiapó, Atacama, Chile. Samuel Gonzalez-Julio, chairman; Daniel Gonzalez-Julio, vice-chairman of Chilean board; Mark Clegg, chairman, and Herbert J. Page, secretary, of London board. L. Tirapegui, secretary, in Santiago; Wm. H. Martin, general manager. Organized June, 1898, under laws of Chile, with capital \$2,100,000, shares \$100 par, fully paid and issued. Dividends paid: 1898-99, 22¼%; 1899-1900, 14%; 1900-1901, 6.5%; 1901-1902, 6.5%. Operations for fiscal year ending March 31, 1903, showed a loss of \$114,840. Lands, 4 groups, in various parts of the Carrizal district, province of Atacama, Chile, including the Chañarcitos mine, in the department of Freirina, opened in 1857, and making about 1,800 tons of refined copper yearly; the Bronces, main shaft 408', opened 1881, at Jarillas Transito, Vallenar, Atacama; the Amarilla, main shaft 417', opened 1867, at Cerro Blanco, Chanarcillo, Copiapó; the Astillas, main shaft 260', opened 1878, in the Carrizal district, and the Armonia and Santa Margarita mines, of the famous Carrizal Alto group, at Carrizal Alto, Freirina, Atacama. Company has a 100-ton smelter at Chañarcitos. The ores are dressed up to 12 to 15% before taking to the smelter, and the product, a matte of 45% to 50% in tenor, is shipped to Wales for refining.

CARRIZAL SHARE TRUST, LTD. CHILE.

Offices: 1, Laurence Pountney Hill, London, E. C., Eng. Owns stock in the Sociedad de Minas y Fundiciones de Carrizal.

MINA CARRIZO.**MEXICO.**

Office: care of Kent E. Keller & Co., owners, 711 Missouri Trust Bldg., St. Louis, Mo. A prospect, about 11 hours' horseback ride west of Autlan, Jalisco, Mexico.

CARTER COPPER CO.**VIRGINIA.**

Name changed, 1903, to Manassas-Gap Copper-Mines.

GUILLERMO CARVALLO.**CHILE.**

Operates the Fundicion de Llallai mine, in the department of Quillota, Chile. Mine opened 1900, and makes the equivalent of 500 tons of fine copper yearly, shipped as matte.

CASA GRANDE COPPER & GOLD MINING CO.**ARIZONA.**

Office: Chicago, Ill. Mine office: Casa Grande, Pinal Co., Ariz. H. E. Bagley, superintendent. Property is the Jack Rabbit mine, carrying gold and silver, with small copper values. Has steam power.

CASA GRANDE MINING & SMELTING CO.**ARIZONA.**

Office: 66 Broadway, New York. Mine office: Casa Grande, Pinal Co., Ariz. Organized June 14, 1902, under laws of Arizona, with capitalization \$5,000,000. F. W. Pope, president; J. Douglass Taitt, secretary; H. H. Douglass, treasurer. Lands, 165 acres, 28 miles south of Casa Grande. Main shaft 150'. A mere stock-robbing device, put out with aid of a lying prospectus by that notorious gang of "mining" sharpers, Douglass, Lacey & Co.

CASCADE COPPER CO.**WASHINGTON.**

Said to be developing by tunnel on silver-lead ores, in the Horseshoe Basin, Washington.

CASCADE COPPER MINING CO.

BRITISH COLUMBIA.

Office: Victoria, B. C. Property is on Uchucklesit Harbour, Alberni division, Vancouver Island, British Columbia. Has an 8' ore body said to give average assays of 19.6% to 28.3% copper from chalcopryite, with about \$1.50 in gold and silver per ton. A shipment of 150 tons to a Tacoma smelter, in 1904, gave net returns of \$22.40 per ton.

CASCADE COPPER MINING CO.

WYOMING.

Office: 1246 Marquette Bldg., Chicago, Ill. Mine office: Encampment, Carbon Co., Wyo. Jas. Barrell, president; H. H. Rand, vice-president; Jas. Jay Smith, secretary and treasurer; Hiero B. Herr, general manager. Property is developing. Company declines to give out information as to its work and finances, which is a mistake if the company is honest.

CASCADES COPPER CO.

WYOMING.

Mine office: Encampment, Carbon Co., Wyo. Capitalization \$1,250,000, shares \$1 par. John T. Baker, president; W. S. Russell, secretary. Lands, 15 claims, including the Pasadena and High Five groups about 7 miles from Encampment, opened by a 100' shaft showing a 20' vein, and a 900' tunnel, cutting two smaller veins.

CASCADIA MINING & DEVELOPMENT CO.

WASHINGTON.

Office: 1 Canterbury Bldg., Portland, Ore. Lands, 16 claims, area 320 acres, including the Polar Star and Minnie Lee groups, on the north fork of the Toutle river, in the Mt. St. Helens district of Washington. The Polar Star shows 32' of ore, opened by a 35' shaft, and a 600' tunnel opens a 2' to 5' vein, assaying 10% to 30% copper, 8 oz. to 70 oz. silver and \$3 to \$11 gold per ton. The Minnie Lee group, 4 miles distant, has about 500' of shaft and tunnels, showing gold-silver-copper ore of concentrating grade.

CASH MINE CO.

ARIZONA.

Mine office: Groom Creek, Yavapai Co., Ariz. Harrington Blauvelt, general manager. Ores, opened by two shafts, carry gold, copper, silver and lead. Has steam power and 10-stamp mill, employing about 40 men.

CASH MINING & MILLING CO.

COLORADO.

Mine office: Gold Hill, Boulder Co., Colo. S. Z. Hoyle, superintendent. Ores carry gold, silver and copper. Has steam power.

CASHIER GOLD MINING & REDUCTION CO.

COLORADO.

Mine office: Central City, Gilpin Co., Colo. B. L. Campbell, superintendent. Lands include the Brooklyn and adjoining claims, showing gold, silver and copper ores. Has steam power and employs about 25 men.

CASTELLANOS y CA.

CHILE.

Operate a small mine in the department of Combarbala, Chile, producing about 75 tons of bars and matte yearly.

MINA CASTILLO DE BUITRON.

SPAIN.

Owned by Compañia del Ferrocarril y Minas del Buitron.

CASTLE DOME EXPLORATION & REDUCTION CO.

ARIZONA.

Office: Tucson, Ariz. Capitalization \$500,000, shares \$10 par. Chas. F. Flack, secretary and treasurer; B. L. Worthen, president; Jas. H. Bennett, general manager. Lands, 17 claims, area 320 acres, 18 miles north of Gila City, Yuma county, Arizona, from which occasional small shipments have been made to smelters in San Francisco during the past 25 years, these rang

ing 37% to 52% copper; 50 to 70 oz. silver and \$8 to \$20 gold per ton. Development is by 10 open cuts, and shallow shafts, deepest only 80'. Property shows a wide mineral zone carrying ore bodies in schist, with a porphyry contact to the north and quartzite and limestone to the south. Company plans sinking a 300' shaft to tap the sulphide zone, and building a small smelter.

CASTREJON HERMANOS.

MEXICO.

Own copper properties in the Huacana district of Ario, Michoacan, Mex.

CATALINA COPPER CO.

MEXICO.

Office: Bisbee, Ariz. Organized February, 1904, with capitalization \$500,000, shares \$10 par. T. J. Wyatt, J. M. Johnson and D. H. Hobbs, directors. Lands are about 30 miles south of La Cananea, in the Arizpe district of Sonora, Mexico.

CATALINA COPPER MINING CO.

ARIZONA.

Office: 4 State St., Boston, Mass. Mine office: Tucson, Pima Co., Ariz. Employs 15 men. Chas. H. Rollins, treasurer; Francis M. Hartman, general manager. Organized under laws of West Virginia with capitalization \$600,000, shares \$2 par. Lands, 15 claims, area 300 acres, also a 30-acre millsite, in the Old Hat district, property including the Silver Reef mine showing numerous contact veins between limestone and quartzite, of which one, under development, has 15' average width and is opened to a depth of 300', also by a tunnel, giving average assays of 6% copper and \$2 gold per ton, mainly from chalcopryrite. Company has worked a small force steadily for several years, securing considerable development, but lacks the rail communication necessary to permit profitable operation upon a considerable scale. Officials well regarded, and property considered promising.

SOCIETE DES MINES DE CUIVRE DE CATEMOU.

CHILE.

Offices: 50, Blvd. de la Senne, Brussels, Belgium and 50, Blvd. Haussmann, Paris, France. Mine office: Nilgve, Putaendo, Chile. Employs 1,200 men. Organized June 2, 1899, under laws of Belgium, with capitalization 5,000,000 francs, shares 500 francs par, divided into 10,000 8% preference shares and 35,000 founders' shares of no nominal value. Debentures, 2,500,000 francs authorized, at 5%; issued, 1,070,000 francs. Achille Adam, president; Max Lyon, managing director; Guillaume Waters, secretary; C. H. Macnutt, general manager; A. Golmann, smelter superintendent; Y. R. Starkey, engineer. Lands, 151 claims, with miscellaneous lands giving total holdings of about 30,000 acres, in the Putaendo, La Ligua, Melipilla, Los Andes, Quillota and Nilgve districts. Mines include El Cobre de Melon mine, in the Quillota district, opened 1886; El Nilgve mine, in the department of Putaendo, opened 1886, and Las Maquinas de Catemú mine, opened 1870, also in the department of Putaendo. Miscellaneous properties include the Mantos mine, opened 1820; Salado mine, opened 1841; La Esmerelda mine, opened 1860 and El Soldado mine, latter all developed by tunnels. Country rock is mainly trachyte, showing contact and fissure veins, some 35 ore bodies of different nature and sizes being under development, carrying an average of 3.5% copper and 2 oz. silver per ton, from carbonate, and oxide ores near surface, and chalcopryrite, bornite and chalcocite at comparatively slight depths. Mines were worked many years by the old Chilean methods,

but are being developed and operated systematically by the present company.

Mines, being developed mainly by tunnels, are without artificial power equipment, but the mills have 225 h. p. and smelters 170 h. p. steam plants. A 60-ton concentrator was completed late in 1904. The smelter, which is one to five miles distant from the various mines, receives ore by carts and aerial trams. Smelter has 150 tons daily, having two 75-ton rectangular water-jacket blast furnaces and five cylindrical 57x77" converter shells. New smelter, of greatly increased capacity, was near completion at the close of 1904. Blast furnaces turn out matte of 45% copper tenor, which is converted to 99.5% blister copper, carrying an average of 32 oz. silver per metric ton. Property is served by the Chilean State Railway. Fuel used is bituminous coal for the mines and concentrator, costing \$9 gold per ton, and coke costing \$16 gold per ton, at the smelter. Production of copper was 1,345 metric tons in 1903 and about 1,900 tons in 1904. New furnaces are 36x96" and 36x120" water-jackets. Property has an abundance of ore averaging about 3.5% copper, and company plans to increase production to about 3,000 tons of refined copper yearly.

CATARACT COPPER MINING CO.**MONTANA.**

Office: 390 The Bourse, Philadelphia, Pa. Mine office: Cataract, Jefferson Co., Mont. Capitalization \$2,500,000, shares \$5 par. Carl S. Weidinger, president; S. B. Vrooman, vice-president; Marcus L. Hewett, second vice-president and general manager; Otis K. Newell, secretary; O. Bergstrom, smelter superintendent. Lands, 22 claims, are in the Cataract district, about 30 miles from Helena, showing argentiferous and auriferous chalcopryite, said by the company to average 2.29% copper, 19 oz. silver and \$7.60 gold per ton. Lands include the Buckeye, Gray Eagle, Bullion, Cataract, Yellow Gambler, Timbuctoo and Goldbug properties, opened by 4 tunnels, of which No. 3 on the Bullion claim has a length of 2,300', mines having a total of about 10,000' of underground openings. The Buckeye mine is said to show a vein with 4' of shipping ore and 16' of concentrating ore. Property has shipped about 4,000 tons of various smelters, securing average returns of nearly \$25 per ton. A 300-ton smelter, guaranteed by company to be in operation July 1, 1903, was blown in just one year later. This has a 300-ton Colorado Iron Works water-jacket blast furnace, with blast heated to 800° F. in "U" stove. The smelter is 8 miles from Basin, near the mine, and very poorly located for economical receipt of fuel and fluxes. The mine has large bodies of low-grade ore, and the future of the property seems uncertain. The promoter, M. L. Hewett, is said to have made individual profits of \$75,000 from the sale of the company's stock.

CATARACT COPPER MINING CO.**WYOMING.**

Office: 1246 Marquette Bldg., Chicago, Ill. Letter returned unclaimed from former mine office, Encampment, Carbon Co., Wyo. Organized under laws of Wyoming, with capitalization \$1,250,000, shares \$1 par. James Barrell, vice-president; James Jay Smith, secretary and treasurer. Lands, 124 acres, developed by several shallow shafts. Company refuses to furnish information.

CAUCASUS COPPER CO., LTD.**RUSSIA.**

Offices: 3, Bond Court House, Walbrook, London, E. C., Eng. Mine

office: Dzansul, Kutais, Russia. Vivian H. Smith, chairman; John Tripp, secretary; J. Stanley James, consulting engineer. Property is 6 groups, known as the Dzansul copper and silver mines, in the Murgne Gorge, Artoin district, government of Kutais, Russian Caucasus. Organized Oct. 4, 1900, with capitalization £500,000, shares £1 par. Considerable development has been secured and the company estimates 2,000,000 tons of ore in sight averaging about 3.5% copper, with small gold and silver values. Ore is chalcopyrite with a silicious gangue, said to occur in a mammoth lense 80 to 150 metres wide and about 300 metres long, opened to a depth of 50 metres, with slight development at an adjacent point on an ore body that may or may not prove to be a continuation of the main lense. Property, formerly known as the Dzansulski Works, made 505,568 lbs. refined copper in 1899, under former ownership and produced 1,946,360 lbs. refined copper for fiscal year 1904. Operations have proven very disappointing, owing to a variety of causes, among which have been peculiar notions of the Russian authorities and troubles with the reduction of the ore, which alimes badly when concentrated, and is so high in silica and deficient in iron that heavy fluxing is necessary, in a district where fluxing ores are secured under difficulties. Plant includes a 300-ton smelter and the Wetherill magnetic separation process is to be tried. Management is excellent, and property, notwithstanding the drawbacks enumerated, is regarded as valuable and likely to make a large and profitable mine in time.

MINA DO CAVEIRA.**PORTUGAL.**

Mine office: Grandola, Portugal. Owned by Crookson & Hawkins. A new property, in process of development.

CEDAR FOREST GOLD & COPPER CO.**ARIZONA.**

Office: 534 Bradbury Bldg., Los Angeles, Cal. Mine office: Kingman, Mohave Co., Ariz. Organized August 27, 1903, under laws of Arizona, with capitalization \$600,000, shares \$1 par. Lands, 9 claims, area 180 acres, near headwaters of the Big Sandy river, said to show a 25' vein carrying gold and copper. Advertisements of company prove that its promoters either are dishonest, or else totally ignorant of copper mining.

CEDAR VALLEY GOLD & SILVER MINING CO.**ARIZONA.**

Mine office: Cedar Valley, Mohave Co., Ariz. Phillip P. Baker, superintendent. Lands include the Arnold, Silver Queen and other claims. Ores carry gold, silver and copper. Has steam power and 15-stamp mill.

COMPANIA MINERA EL CEDRO.**MEXICO.**

Mine office Guanajuato, Guanajuato, Mexico. Vincente Gonzales, manager. Has steam power and is a producer of gold and copper, employing about 50 men.

CENTENNIAL MINE.**COLORADO.**

Office and mine: Georgetown, Clear Creek Co., Colo. David Kennedy, general managers; S. G. Evans, superintendent. Lands, about 1 square mile. Has cupriferous gold and silver ores in a 30" paystreak opened in 1903, assaying up to 24% copper, 5 oz. to 150 oz. silver and 3 oz. to 5 oz. gold per ton. Has steam power and employs about 20 men.

CENTENNIAL BINGHAM MINE.**UTAH.**

Succeeded by South Columbus Mining Co.

CENTENNIAL-EUREKA MINING CO.**UTAH.**

Offices: 4, Postoffice Sq., Boston, Mass., and 508 Dooly Bldg., Salt Lake City, Utah. Mine office: Eureka, Juab Co., Utah. Practically entire stock issue is held by United States Mining Co. R. D. Evans, president; F. W. Batchelder, secretary and treasurer; A. F. Holden, managing director; C. E. Allen, superintendent. Organized 1876, under laws of Utah, with capitalization \$5,000,000, shares \$25 par; issued, \$2,500,000. Has paid dividends of more than \$2,500,000. Ores carry silver, gold, copper and lead. Has steam power and concentrator, employing 150 to 200 men.

CENTENNIAL COPPER MINING CO.**MICHIGAN.**

Office: 60 State St., Boston, Mass. Mine office: Calumet, Mich. Organized 1896, under laws of Michigan, succeeding the Centennial Mining Co., with capitalization \$2,500,000, shares \$25 par; issued, \$2,250,000. Last assessment was \$4, in 1904, making stock \$16.77 paid in. Annual meetings are in April. H. F. Fay, president; Geo. G. Endicott, secretary and treasurer; James Chynoweth, superintendent; preceding officers, John C. Watson, Wm. Howell Reed and Stephen R. Dow, directors; John Pentecost, mining captain; Alonzo Nicholas, chief clerk; G. A. Goodell, engineer; Alex. G. Andrews, master mechanic.

Official returns to the state of Michigan, as to date Jan. 1, 1904, disclose the following figures.

Amount cash paid in on capital stock.....	\$1,150,000.00
Entire amount invested in real estate.....	249,457.01
Amount of personal estate.....	137,459.96

Lands, 660 acres, being Section 12, Town 56 North, Range 33 West, also a triangular patch of about 20 acres at the southeastern corner of the main tract, bought to secure the outcrop of the Kearsarge lode. The first development work was done in 1863, by the Schoolcraft Mining Co., which failed to open a paying mine, and was reorganized, 1876, as the Centennial Mining Co., and again reorganized, 1896 with present title. Expenditures of upwards of \$1,500,000 were made, mainly by the old company, in unsuccessful efforts to open a paying mine on the northern extension of the Calumet conglomerate. Seven shafts, 3 of considerable depth, were sunk on this bed, No. 3, the deepest, being bottomed at 3,200'. Work on this lode was sufficiently extended to fully demonstrate the worthlessness of the Calumet conglomerate on Centennial property. The Centennial lands are in the great mining camp of Calumet, and are available for building purposes. Two additions have been platted and the lots sold at good prices. Only surface rights are sold, mineral being reserved by the company.

The present management wisely abandoned the conglomerate shafts in 1897, after a few months' efforts, and deepened two shallow shafts on the Osceola lode. These are 7x12' inside of timbers, sunk at angle of 38° and are 1,050' and 1,150' in depth respectively. Upon securing the 20-acre tract carrying the outcrop of the Kearsarge lode, which underlies the Centennial's entire square mile of territory, the work of development was begun in September, 1899. Owing to the narrow width of the tract secured from the Osceola company, it was necessary to develop in a peculiar manner, by two shafts, "A" and "B," which are but 90' apart at a surface, and continue parallel on the dip

of the lode until the 13th level, when the Centennial's main tract is reached, after which "B" shaft diverges from "A" at an angle of 15° on the plane of the lode, 300' being taken by a curve to secure the divergence of 15° . This plan of opening gives short drifts until the shafts enter the main Centennial tract, after which length of openings is gained rapidly with depth. At the close of 1904 "A" shaft was 2,825' and "B" shaft 1,800' in depth. Each shaft is 7x18' inside of timbers, with three compartments, and sunk at an angle of 39° with the horizon. The overburden is about 100' and the amygdaloid averages 15' to 18' in width. Fair copper values were obtained in the first few levels, after which a comparatively barren zone was penetrated until the 14th level was reached, after which came gradual improvement. The 25th and levels below show excellent copper ground, with many good stopes. The upper levels of "A" shaft, partially caved in by surface seepage, have been completely retimbered, and the mine now has nearly 5 miles of underground openings. "A" shaft has 5-ton skips and can be sunk on the lode 12,000' before reaching the boundary line. "B" shaft was holed through to surface in 1904. "A" shaft has a 32x72" Nordberg duplex-cylinder hoist with double conical drum, good for 6,000' depth, and "B" has an old hoist taken from No. 6 conglomerate shaft, good for 2,000' depth, to be replaced later by a Sullivan straight-face duplex hoist with duplex cylinders and 14' drum of 15' 6" face, good for one mile depth.

Owing to the close proximity of the shafts, rendered necessary by the peculiar conditions that gave the company merely a right-of-way into the main tract, but one rockhouse is required, this being at "A" shaft. The combination shaft-rockhouse at "A," built 1903, is of wood frame, covered with corrugated iron, having 3,000-ton rockbins. The rockhouse has 18x24" rock-crushers and is connected with "B" shafthouse, 90' distant, by trestle, with mechanical haulage for loaded and empty tram-cars.

The engine-house is of stone, as is the compressor house, 32x46', which has 35-drill Nordberg and 18-drill auxiliary air compressors, and a Dean jet condenser in the basement. The boiler-house, 54x58', has four 125-h. p. Burt locomotive firebox boilers, and a brick-lined self-supporting steel smokestack 7' in diameter and 125' high. A 16x46' frame pumphouse with corrugated iron roof has a fire-pump, fire-hose and hose-carts. The combination machine shop and smithy is 50x108', with redstone walls and steel truss roof, fitted with traveling cranes and a full complement of shop and blacksmithing tools, and has a railroad track running from end to end. The carpenter shop is 36x50' and the warehouse is 30x40' in size. A new office building is 30x40', and the miners' change-house is 25x50', with hot and cold waters, lockers, etc. The company also has a large number of substantial dwellings for employees and the surface plant is one of the best, both in plan and equipment, to be found in a district where good plants are the rule. The mine is served by the Copper Range and Mineral Range railroads, connecting with the company's private rail line.

The old single-head mill at the mine, having survived its usefulness, was sold and dismantled in 1904, and the Arcadian mill, at Grosse Pointe, Portage Lake bought in 1904 for a price understood to be \$296,000, with two years time in which to pay for it. The millsite is of 406 acres, with water frontage

of $1\frac{1}{4}$ miles and ample room to waste all sands, and has a number of good dwellings for the use of employees. The mill is $132 \times 124'$ in size, of steel, and has 3 Nordberg stamps, with foundations in for 3 more heads. There is a 15,000,000 gallon Nordberg pump, auxiliary machine shop, smithy, etc. The foundations under the heads were found in bad shape, and a new $12'$ concrete foundation was given one head, which was rebuilt and compounded, giving it a daily capacity of about 700 tons. The mill has a wharf running $675'$ into deep water, and is fitted with modern coal hoists and a good coal-shed. The intake of the pump was extended several hundred feet into deeper water.

The mill begun stamping, with the remodeled head, July 5, 1905. The stockpiles at the mine were milled, in addition to the rock produced from stoping, and the mill has treated an average of nearly 400 tons daily, securing therefrom about 10 lbs. fine copper per ton, giving a production of only 641,294 lbs. for 1904, from 6 months' work. The operations of the past 6 months have shown several things quite plainly, among these being the incapacity of the mine to furnish an ample supply of selected rock. The lower levels give rock probably averaging 15 to 20 lbs ingot per ton, but the average is sadly reduced by the poor returns from the lean rock of the upper levels. More openings are needed, and a \$4 assessment will be levied early in 1905. This money is necessary, although the call will be very distasteful to shareholders, and only by greatly increasing the underground openings, thus permitting a better selection of rock, can the average returns be brought up to a profitable point.

CENTRAL ARIZONA MINE.**ARIZONA.**

Mine office. Williams, Coconino Co., Ariz. Rounseville & Hardesty, owners; E. M. Hardesty, superintendent. Ores carry gold, silver and copper. Has gasoline power.

CENTRAL BLACK HILLS COPPER CO.**SOUTH DAKOTA.**

Office: 701 New England Bldg., Cleveland, Ohio. Mine office: Custer, Custer Co., S. D. E. M. Barnes, president and general manager; L. M. Chartrain, secretary; H. H. Francis, superintendent. Organized July, 1902, under laws of South Dakota, with capitalization \$1,500,000, shares \$1 par. Lands, 30 claims, area 600 acres, also a 40-acre millsite and miscellaneous lands giving a total area of 720 acres, in the Pennington district, showing sundry veins, of which two of $18'$ average width, opened by shafts of $85'$ and $110'$ and tunnels of $42'$ and $225'$, are contacts between slate and quartzite, giving average assays of 6% copper, 2 oz. silver and \$4 to \$200 gold per ton, from azurite, malachite and chalcopyrite. Ore is expected to average about 3% copper in actual treatment. Has a 200-h. p. steam plant and power drills, concentrator with 2 crushers and 4 jigs and 100-ton leaching plant, planned to turn out cement copper. Also has a sawmill. Purposes driving tunnel on ledge about $1,200'$ and installing a 6-drill air compressor in 1904. Company's officials are men of good standing and the property shows large bodies of low-grade ore that gives promise of successful treatment by lixiviation.

CENTRAL CHILI COPPER CO., LTD.**CHILE.**

Offices: 15, Angels Court, London, E. E., Eng. Mine office: Panulcillo, Ovalle, Coquimbo, Chile. Eugene A. J. Goldschmid, chairman; Henry B.

Greenwood, secretary; Count B. de St. Steine, general manager. Registered Jan. 11, 1898, as a second reconstruction of the Panulcillo Copper Co., Ltd., with capitalization £300,000; issued, £276,248; debentures, £19,298, at 4%. This company and its predecessors have worked the Panulcillo mines since 1894. Group includes the Panulcillo and San Gregorio, at Panulcillo, and the Inagotable, Cocinera and Condessa mines at Huamalota Sataqui, Ovale. The mines are all small, except the Panulcillo, which has a 120-ton smelter, employing about 650 men and producing about 1,600 tons of refined copper yearly, partly from custom ores. Mines are said to show reserves of 250,000 to 300,000 tons of ore ranging 3% to 7% in copper tenor. Production for 1902 was 1,571 long tons fine copper, for 1903 was 1,602, and for 1904 was 2,254 tons. Prospects of company seem improving.

CENTRAL GOLD & COPPER CO.**NEW MEXICO.**

Mine office: Mineral Hill, Donna Ana Co., New Mexico.

LA GRAN FUNDICION CENTRAL MEXICANA.**MEXICO.**

Office and works: Aguascalientes, Aguascalientes, Mexico.

CENTRAL MINING CO.**MICHIGAN.**

Office: 15 William St., New York, N. Y. Joseph E. Gay, president; J. Wheeler Hardley, vice-president; John Stanton, secretary and treasurer; F. McM. Stanton, agent. Mine, in Keweenaw county, Michigan, was opened 1854, on a fissure vein, and closed down 1898, after paying dividends of \$1,970,000. Diamond drill borings giving a complete cross-section of the extensive lands of the company show 3 amygdaloidal beds carrying a little copper. An experimental plant, built to rework the extensive tailings of the old mill, did not prove commercially successful, and has been abandoned.

CENTRE STAR MINING CO.**BRITISH COLUMBIA.**

Mine office: Rossland, B. C. E. B. Kirby, manager. For year ending September 30, 1903, made net earnings of \$265,000, of which the sum of \$195,000 was used in liquidating previous indebtedness. Mining costs were only \$1.97 per ton, a low record for the Rossland district. For 1904, production was 77,892 tons of ore, averaging \$7.75 in gross smelter values, with average assays of 0.72% copper, 0.35 oz. silver and 0.36 oz. gold per ton. Mine is extensively developed, having done 2,701' of new opening work in 1904. The high-grade ores of upper workings have been almost exhausted, and present ore bodies, while large, are low in grade. Ore reserves, Dec. 31, 1904, are estimated at 50,000 tons, with an average smelter value of \$8 per ton.

CENTURY MINE.**ONTARIO.**

Office: care of Foster & Black, Sudbury, Ont. Location, Graham Twp., Algoma, Ont. Assays give 7% to 13% copper, and from a trace to \$26 gold per ton.

CERESIER MINE.**FRANCE.**

Was the principal copper producer of France, when working, but has been idle for some years.

CERMA DEVELOPMENT CO.**ARIZONA.**

Office: Calumet, Mich. Organized, 1903, to develop a group of 47 claims in the Huachuca Mountains, Cochise county, Arizona. Probably idle.

CERRO COPPER CO., LTD.**PERU.**

Offices: 1, Laurence Pountney Hill, London, E. C., Eng. Wm. Henry Watts, chairman; Herbert J. Page, secretary. Capital, nominal, £101,000. Organized to acquire claims in the Cerro de Pasco district of Peru.

CERRO DE PASCO MINING CO.**PERU.**

Office: 15 Broad St., New York. Peruvian general office: Lima, Peru. Mine office: Cerro de Pasco, Peru. Organized June 6, 1902, under laws of New Jersey, with capitalization \$10,000,000. Control supposed to be owned by Jas. B. Haggin, Pierpont Morgan, H. McK. Twombly and others, of New York. Alfred W. McCune, general manager, Lima, Peru; A. E. Welby, superintendent of railroad, Oroya, Peru; Jas. MacFarlane, superintendent of mines, Cerro de Pasco, Peru; Frank Klepetko, consulting engineer, New York; C. H. Repath, assistant consulting engineer; W. F. Blackford, chief engineer; John J. Case, smelter superintendent. Lands, about one square mile, comprise about three-fourths of the rich Cerro de Pasco district, and are said to have been acquired at a cost of about \$2,650,000. Tract is in a compact body, the surface showing many "tajos," caves remaining from ancient open-cast workings. The lands lie in a basin, hence tunnelling is difficult, the only important opening of this sort being the Rumallana tunnel. The company also owns extensive coal lands, north of the copper mines, the coal being bituminous and coking well.

Silver was discovered at Cerro de Pasco in 1630, and the production of the district to the close of the Nineteenth Century is estimated at 450,000,000 ounces, secured from about 40,000,000 tons of silver and copper ore, nearly all extracted by hand labor and carried 3 to 6 miles on the backs of llamas to primitive smelters, from whence the silver bullion was transported by llama 200 miles to Lima, until circa 1870, when the railroad was completed to Oroya.

The Cerro de Pasco district is located 14,300' above sea-level, rendering physical labor very fatiguing. The population of the town is variously estimated at 5,000 to 20,000. The surrounding country is bleak, and all food and supplies must be brought in from considerable distances. The year is divided into two periods, the wet and dry, the wet season being from November to April. The summers are not hot, owing to the great elevation, and the winters are not cold, owing to the low latitude. Snow and hail fall at any time, summer or winter, but rarely remain as long as 48 hours, even in winter. The fluctuation between mean summer and winter temperatures is about 20° Fahrenheit, only.

Authorities disagree hopelessly as to the geology of the district. All that can be said with certainty is that in an area approximately one mile wide and between one and two miles in length there is ore on nearly every claim, proving the Cerro de Pasco one of the richest mineral deposits of the globe. The ores carry gold, silver, copper, cobalt and other metals, values being found in two zones, the upper carrying mainly silver, in quantities from a few ounces to thousands of ounces per ton, in decomposed quartz. Considerable gold is found in the upper zone, this running as high as 1 to 2 oz. per ton, occurring in rich but erratic chutes. The silver values usually extend to a depth of about 100', followed by silver-copper ores and at a little lower depth by copper-silver ores. All of the copper ores are more or less argenti-

ferous, being estimated to average 15 to 35 oz. of silver per ton, and practically all of the copper ore is bismuthiferous also, hence highly refractory in reduction. In the past only the richest copper ores have been worked, those shipped ranging from 25% to 40% in tenor. Claims advanced that the ores of the district will average 25% copper are entirely unwarranted, as the high-grade ore shipped was carefully hand-selected, owing to excessive transportation charges. The copper ores grow leaner with depth, as in other districts, and values below the permanent water level, at about 250', seem somewhat uncertain, though indications favor the existence of large and permanent sulphide ore bodies of good grade. In but few cases have any of the old mines been opened to depth of more than 200', while the great majority are less than 100' in depth. The company is sinking 5 two-compartment shafts, and there are 3 drainage tunnels in the district, the only one of importance being the Rumailana, begun by Henry Meiggs in 1887 and discontinued at a distance of 1,000' because of his death. Meiggs held a concession from the Peruvian government for 25% of the gross values extracted by mines drained through this tunnel. This concession is now held by a company, which has cleaned out the old heading and driven the tunnel to length of 1,466'. There is a possibility of litigation between the Cerro de Pasco and this corporation in case the latter completes the tunnel. The ore in sight in the district was estimated at 5,000,000 to 6,000,000 tons in 1899.

There are a few small copper matting furnaces, with a daily capacity of perhaps 250 tons, in the Cerro de Pasco district. The company's new smelter, 9 miles south of the mine, on the main railroad line, is of 1,000 tons daily capacity, and is equipped with two blowing engines for the converters, each capable of compressing 24,000 cubic feet of free air per minute to a pressure of 17 lbs. per inch, and to be operated by 1,500-h. p. Nordberg engines, also five 350-h. p. blast furnace blowing-engines with capacity to compress 30,000 cubic feet of free air to a pressure of 2.5 lbs. per inch. For general power purposes there will be two 475-h. p. Nordberg engines, direct-connected with 350-kw. generators. The furnaces and much of the machinery are supplied by the Allis-Chalmers company, and the boilers, of 4,000 aggregate h. p., are of Babcock & Wilcox make.

The mine is served by the Cerro de Pasco Railway, building by the Cerro de Pasco Railway Co., closely affiliated with the Cerro de Pasco Mining Co., under a government concession. This line runs about 80 miles from Cerro de Pasco southward to Oroya, and is to be extended northward to the company's coal mines. Including the main line, spurs and sidings, it will have about 125 miles of track. The company is said also to have under consideration the extension of this line past the coal mines, through a very rugged country said to be rich in copper and silver. The line will have an average grade of 1.5%, with a maximum grade of 3% and will cost upwards of \$2,000,000. At Oroya connection is made with the Central Railway of Peru, running 130 miles to Callao. In this distance the line, which cost \$43,000,000, gains nearly 3 miles vertical elevation, reaching the highest altitude of any railroad on the globe, after surmounting almost incredible obstacles.

Wages are 25c. to 50c. per day for natives and \$2.50 to \$4 per day for white labor. The native labor is said to be tractable and fairly efficient.

Owing to the great distance of this property from other copper centers, its magnitude and promise have been somewhat exaggerated, and many misleading articles have appeared in print, these being, however, in no wise ascribable to the management, which has no stock for sale and does not court publicity. The Cerro de Pasco property is one of great size and exceptional promise, but there are many and serious obstacles in the way of making it a large and successful mine. Some of these difficulties have been overcome, while others are in process of elimination, and the balance probably will be conquered in the future, as the company has great financial strength and its principal shareholders are men of long and successful experience in mining. The actual work in all departments is in the hands of thoroughly competent and experienced men.

SOCIEDAD CERRO DE PASCO.

PERU.

Supposed to be Peruvian title of the Cerro de Pasco Mining Co.

CERRO DE PASCO TUNNEL & MINING CO.

PERU.

Office: 45 Wall St., New York. Organized Aug. 8, 1902, under laws of Maine, with capitalization \$12,000,000, shares \$10 par, half in 7% cumulative preference shares and half in common shares. A. B. Rawls-Reader, president; H. N. Carter, treasurer; E. Rawls-Reader, secretary. Lands, 196 hectares, about half in the Yauli district and half in the Acari district, latter 37 miles from Lomas. Supposed also to hold an option on the Rumillana or Meiggs drainage tunnel in the Cerro de Pasco district. Company claims to expect to produce about 3,000 tons of ore daily, "when all machinery is installed."

CERRO MURIANO MINES, LTD.

SPAIN.

Offices: 6, Queen St. Place, London, E. C., Eng. Mine office: Manriques 9, Córdoba, Andalusia, Spain. Employs 100 to 150 men. Wm. Frecheville, chairman; John Taylor & Sons, managers; F. H. Williams, secretary; Richard E. Carr, British vice-consul at Córdoba, superintendent; Joseph Tamblyn, mine superintendent. Organized May, 1903, with capitalization £125,000, shares £1 par, 5s. paid. Lands, 314 claims, freehold, area 776 acres, 10 miles northeast of Córdoba, showing sundry old mines, which were worked to depth of at least 400' during the Roman era, notwithstanding their wetness. Property shows 6 large and several small fissure veins in micaceous schists, diorite and quartzite, carrying chalcopryrite and iron pyrites, with a gangue of calcite, quartz, clay and country rock. Veins have widths of 1' to 40', with following lengths: Calavera, 1,635'; Excelsior, 635'; Lorenzo, 4,575'; Isabel, 5,550'; Cerro Muriano, 8,500'. Ore taken from old Roman workings has assayed 28% to 34% copper. Main shafts are 300 metres apart, the Santa Victoria having 646' depth and San Rafael 574', former shaft cutting the vein at 130 metres and 160 metres, ultimately passing through the vein, still in old workings, at 177 to 195 metres. The San Rafael has crosscuts at depth of 100, 132 and 154 metres, each level showing a vein of 5 to 13 metres width, with the better portions worked out by the Romans. The San Rafael shaft has been enlarged and is the main pumping shaft. Mines have a 1,000-h. p. steam plant, with 2 hoists and a 5-drill Walker air compressor. This is one of the largest and most

interesting of the old Hispano-Roman mines, and was famous before the Christian era for the high quality of copper and brass produced from its ores, but was entirely idle for some 2,000 years until reopened by the present owners.

CERRO VERDE MINE.**MEXICO.**

Mine office: San Javier, Sonora, Mex. C. C. Rountree, owner; W. M. Kiddie, superintendent. Is developing by shaft and tunnel.

SUCESION CERVERO.**CHILE.**

Office and mine: Petorca, Aconcagua, Chile. Operates the Cabildo mine, opened 1886, producing the equivalent of 800 tons refined copper yearly, shipped as matte. Also owns the following old mines at Nipa and Coligue; Montoya, opened 1855, developed by 900' tunnel; Castillo, opened by 400' shaft; Quisco, opened by 300' shaft, and Cuevas, opened by 120' shaft. Employed about 250 men, at last accounts.

CETINI MINE.**ITALY.**

Near Pisa, in the Volterrano district of Italy. A comparatively new mine, with occurrence and nature of ore similar to the Montecatini. Is a small producer of copper.

CHALCHIHUITES MINES CO.**MEXICO.**

Office: 288 Garside St., Newark, N. J. Mine office: Chalchihuites, Zacatecas, Mexico. Edw. H. Jones, president; C. C. Hamer, secretary; B. W. Farris, general manager. Lands, 192 pertenencias, including the San Nicolas mine, carrying ores of gold, silver, copper and lead. Is opened by shaft, equipped with steam power and employs about 40 men.

CHALLENGE MINE.**MICHIGAN.**

Owned by St. Mary's Mineral Land Co.

CHAMPION COPPER CO.**MICHIGAN.**

Office: 27 State St., Boston, Mass. Mine office: Painesdale, Houghton Co., Mich. Employs 800 men. Organized December, 1899, under laws of Michigan, with capitalization \$2,500,000, shares \$25 par. Entire stock issue is owned jointly by Copper Range Consolidated Co. and St. Mary's Mineral Land Co. Wm. A. Paine, president; Arthur G. Stanwood, vice-president; Frederic Stanwood, secretary and treasurer; preceding officers, Samuel L. Smith, Chas. H. Paine, Geo. P. Gardner and Richard Olney, directors; Dr. Lucius L. Hubbard, general manager; R. R. Seeber, engineer; John Broan, mining captain; M. J. Harrington, clerk; F. G. Coggin, mill superintendent; R. H. Leach, assistant mill superintendent; John Mackay, superintendent of motive power; W. E. Campbell, master mechanic. Dividends were \$300,000 in 1903, and \$200,000 in 1904, the company closing the year in very strong financial position. The Champion Copper Co., holds \$44,000 stock of the Michigan Smelting Co.

Official returns to the state of Michigan, as of date Jan. 1, 1904, disclose the following figures:

Amount cash paid in on capital stock.....	\$1,475,000.00
Amount paid in by conveyance of property to company ..	1,025,000.00
Entire amount invested in real estate.....	1,025,613.94
Amount of unsecured or floating debt.....	462,954.12
Amount due corporation.....	11,859.80

Lands, 1,240 acres, consisting of the south half of Section 30; west half and north half of northeast quarter and southwest quarter of northeast quarter of Section 31, Town 54 North, Range 34 West; southeast quarter of Section 25 and east half of Section 36, Town 54 North, Range 35 West, practically all on the mineral belt. Neighbors of the Champion are the Copper Range and Trimountain on the north; lands of St. Mary's company and Hussey, Howe & Co. on the east; Hussey-Howe lands and the Globe property on the south, and the Copper Range tract on the west. The tract gives a distance of 8,960' on the strike of the lode, and at the present angle of dip the deepest shaft can go down 18,950' before reaching the company's boundary line on the west.

Development was begun in the spring of 1899, under direction of Dr. Hubbard, and 3 parallel amygdaloids were uncovered by trenching, one of which, the Baltic lode, showed phenomenal copper values. The two amygdaloids paralleling the Baltic lode show copper in sufficient quantities to render their future exploration advisable. A fourth amygdaloid, about 15' wide, discovered east of the Baltic lode in 1901, carries heavy copper to a promising extent, and there also is a fissure vein of arsenical ore, apparently algodonite, near "C" shaft. The width of this vein at surface is slight, and mineral contents variable, but on the second level the fissure is 2' wide and well mineralized.

The dip of the Baltic lode at the Champion is about 70°, with about the same strike as at the Trimountain, rather than the exaggerated easterly trend noted at the Baltic mine. The bed runs 13' to 45' and averages 24' width, carrying more epidote than at the Trimountain and Baltic. The surface of the tract is very hilly, but the overburden in less than is found either to the northward or southward. The stretches of lean ground in the mine are few, and the lode carries heavy copper in profusion, mostly in barrel size, but running up to masses of 10 tons in weight. The mine had 29,132' of drifts at the end of 1904. Only about 15% of the rock broken is discarded, and the rock milled returns about 28 pounds of refined copper per ton.

The Champion has four shafts, numbered from north to south, with room for four more. Locations of these shafts and depths on Jan. 1, 1905, were as follows: "B" shaft, the northernmost, is 1,835' south of the Trimountain line, with collar 635' above mean water datum of Lake Superior and is 963' deep; "C" shaft is 1,050' south of "B", 616' above the lake and 886' deep; "D" shaft is 1,300' next south, 621' above the lake and 1,012' deep; "E" shaft is 1,300' next south, 3,900' north of the boundary line of the Globe tract, and is 1,104' deep. "A" is merely a site for a possible shaft. All four shafts are connected on the upper levels, with other connections driving. The lode has so little poor ground that in all likelihood nearly every drift will be driven from end to end of the mine, giving the longest average levels ever opened in any Lake Superior property if not in the world. The Champion, by virtue of its exceptionally regular values, permitting long drifts on every level, is peculiarly adapted to power haulage and the installation of underground electric traction is now under consideration. The only poor showing made in the mine was at "E" shaft, where the ground was disturbed and carried little copper on the second and third levels, but

became quite regular and well mineralized on and below the fourth level, and at the present depth is showing some of the very best ground opened anywhere in the mine. The mine has some stopes that are phenomenal for width and richness, probably carrying as much copper per running foot as the best average stopes of the Calumet & Hecla.

The shafts have duplicate combination shaft-rockhouses, 40x50' on the ground, each with steam hammer for heavy copper, one 12x15" and two 18x24" crushers, engines and storage bins, except that "D" shaft has three of the larger size crushers. Each shaft has a hoist good for 1,500' depth, and at "D" shaft a new hoist is being installed, this being a Nordberg with 24x60" duplex cylinders and double conical drum, good for a depth of 3,000'. The engine house at "D" is of mine rock with redstone trimmings and the boiler-house adjoining has a battery of Burt locomotive firebox boilers.

The principal mine buildings are of steel and sandstone, located about a quarter mile south of "E" shaft in the ravine across from the point where "F" shaft was started, but abandoned because of a treacherous overburden. This ravine has been dammed, impounding about 12,000,000 gallons of water for boilers, the dam being 30' from hardpan foundation to crest, with a cement core 5' at the bottom and 2' at the top, reinforced by rock. The machine shop, 60x144', of sandstone with slate roof, has a traveling crane and trolley rail for its entire length and is equipped with a complete line of shop tools, power being supplied by a 30-h. p. electric motor. Standing beside the machine shop, and also of red sandstone, is the 50x128' smithy, which has a trolley rail for handling forgings running the entire length of the shop. Both machine shop and smithy have railroad tracks connecting with the Copper Range road. The carpenter shop, of wood with iron roof and siding, is 32x60' in size.

The main compressor building, at "F" shaft, is of steel, housing a 100-drill quadruple expansion two-stage Nordberg air compressor, with capacity to compress 9,120 cubic feet of free air per minute to a pressure of 70 lbs per inch. The compressor operates at a steam pressure of 280 lbs. and has a regenerative feed-water system. Power is furnished by three 250-h. p. Geary water-tube boilers. The delay in delivering this big compressor proved very awkward for the mine, which had grown far past the air power then available. At "B" shaft is a 40-drill cross-compound two-stage Ingersoll-Sergeant air compressor with vertical receiver intercooler. The electric light plant is in the main compressor building. A coal bunker at "F" shaft has railroad tracks on trestles, with a tunnel below each trestle, coal being drawn, as required, through hatches into hopper cars in the tunnel, these passing over an inclined track into the boiler-house, saving much labor in the handling of fuel. There is an automatic telephone system, with 30 stations connecting the principal buildings and a number of pump-stations underground. The annual coal consumption, at mine and mill, is about 20,000 tons.

The company owns a good office building, two miners' changing houses, warehouses, stables, three large boarding houses and 244 substantial dwellings. The townsite, an unusually attractive one for a mining camp, is called Painesdale, and in addition to the company's buildings has a hotel, schoolhouse and

several business houses. The Sarah Sargeant Paine memorial library, a handsome red sandstone structure costing \$30,000, was erected by Wm. A. Paine, president of the company, as a memorial to his mother and is much appreciated by the company's employees. The water system, serving the mine and town jointly, has a 1,000,000-gallon electric pump at Lake Perreault, $4\frac{1}{2}$ miles distant, and a 200,000-gallon steel stand-pipe on high ground near the mine.

The stampmill, at Freda, on Lake Superior, about 2 miles west of Redridge, is 178x215' in size, of steel and concrete, built by the Wisconsin Bridge & Iron Co., with an 88' addition building for 2 more stamps. At present there are 4 Nordberg heads, each with a 15' concrete foundation, and the washrooms have cement floors. The mill has 40 Overstrom concentrating tables, and Hodge graduated adjustable-speed jigs having plungers to work simultaneously or alternately in pairs. All heads were cross-compounded in June, 1903, being the first stamps to which the principle was applied, and during the summer months of 1903 the heads crushed 42 tons of rock for each ton of coal burned—a new low record for the district. Regrinding of raggings is done by Allis-Chalmers crushing rolls, having one roll in a fixed bearing and one with a spring adjustment. Each head has two settling tanks, the first 8' square and 3' deep, with "V" bottom, connected by a fan-shaped apron with the second tank 16' square with a "W" bottom. Velocity of flow of slimes is 10 feet per second in first and only 1' per second in the last tank. Pulp is withdrawn through spigots at the bottom of each tank. The mill is to conduct careful experiments in breaking rock by crushers and rolls, with a view to lessening the present losses through sliming.

The mill is heated by hot water from a Green fuel economizer, piped at 300° to 350° Fahrenheit to a steel-clad chamber, whence heated air is drawn into ducts by a blower and distributed through the mills, the water being pumped back to the economizers and thence fed to the boilers. The steel boiler-house has five 250-h. p. Springfield boilers of Scotch type and four 200-h. p. Stirling boilers, with Green fuel economizer, Detroit automatic stoker and Sturtevant blower. Coal is brought to the boilers by gravity tram and reduced to uniform size by a grinder before fed to the grates, while ashes are washed into the lake through a launder by jets of water. Exhaust steam passes through dry condensers, thence to a hot-well, from which water is fed into the boilers at a high temperature.

The 40x60' steel pumphouse, with truss roof and traveling crane, houses a 20,000,000-gallon triple expansion Nordberg pump. Water for the mill and boilers comes from Lake Superior through a tunnel 1,020' long, the shore end having a well with bottom 8' lower than the lake level, this being the longest tunnel ever driven under Lake Superior. The intake crib has a free area of 45 square feet, and with a second crib the tunnel could furnish water for 8 to 10 stamps. The water cost was about $1\frac{1}{2}$ cents per ton of rock stamped in 1903, somewhat under the average of the district. The tailings from the mill average about 0.25% copper only. The mill has a private telephone system, machine, carpenter and blacksmith shops, ware-houses, fire-pump and water mains with 5 hydrants, and there are about 20 dwellings for employees at the millsite.

The Champion has been admirably handled from its inception, and is proving one of the richest and largest among Lake Superior mines. Production was begun with one leased stamp in 1902, and the property's steady growth is shown by the following figures of production: 4,165,784 lbs. fine copper in 1902; 10,564,147 lbs. in 1903, and 12,212,954 lbs. fine copper in 1904. But for serious delay in receiving the new compressor and a four weeks' strike, the 1904 production would have been larger, and 1905 will show a material gain, while 1906 should show a very large increase in output. The amount of refined copper secured is 27 to 28 lbs. per ton, placing the Champion secured only to the Wolverine among the Lake Superior amygdaloid mines. Rock shipments, averaging about 1,650 tons per day, will be increased to about 2,000 tons, early in 1905.

CHAMPION COPPER MINING CO.**IDAHO.**

Mine office: Mullan, Shoshone Co., Idaho. Lands, sundry claims on Stevens Peak, 4 miles south of Mullan, opened by a 600' tunnel on a vein ranging up to 25' width, carrying chalcopryite assaying about 5%, with quartz and calcite gangue.

CHAMPION GOLD & COPPER MINING CO.

Office: California Blk., Tacoma, Wash.

CHAMPLAIN MINING CO.**IDAHO.**

Letters returned from former mine office. Doniphan, Blaine Co., Idaho.

MINA LA CHAPARRITA.**SPAIN.**

Mine office: Nerva, Huelva, Spain. A group of 11 old mine openings, area 106 hectares. A little copper is produced by cementation from the mine waters.

CHAPPELL MINE.**VIRGINIA.**

Controlled by Howard Mining Co.

CHARLOTTE & CONSTANCE MINES.**NEW CALEDONIA.**

Mine office: Bonde, New Caledonia. These properties show large outcrops and have been described by the French authorities as mountains of ore, but it cannot be learned that any serious attempts at development have been made.

CHARM & COPPERHEAD GROUPS.**UTAH.**

In the Drum Mountain district of Utah, sometimes known as the Busby & Clive properties. The Charm group is said to have considerable ore blocked out and to carry good values in copper and gold.

CHARTER OAK COPPER**BRITISH COLUMBIA & WYOMING.****MINES, LTD.**

Offices: 16, Victoria St., London, S. W., Eng. Mine office: Saratoga, Carbon Co., Wyo. Sir H. Seton-Karr, M. P., chairman; T. Toten Willcox, secretary; J. B. Hassett, mine manager. Organized June 22, 1898, with capitalization £40,000, shares £1 par; issued, £28,957. Lands include two properties in British Columbia, also 84 acres and 5-acre millsite in the Upper Platte district of Carbon Co., Wyo., latter showing 2 fissure veins averaging 12' wide, and carrying oxide and sulphide ores giving assays of 4.5% copper, 2 oz. silver and \$4 gold per ton. Main shaft, 488', with 750' of underground openings. Former development was misdirected, shaft being sunk at right

angles to the vein. Has steam power. Said to plan resumption of mining at the Wyoming properties.

CHASE CREEK COPPER CO.

ARIZONA.

Mine office: Clifton, Graham Co., Ariz. Capitalization \$5,000,000. Clarence K. McCornick, president; H. G. Smith, treasurer; S. S. Campbell, manager; I. N. Stevens, superintendent. Lands, 52 claims, area 1,040 acres, well located next to producing mines. Development is by a 6x8' tunnel of about 600', on lands adjoining the Longfellow mine. Tunnel cut the Longfellow ore body of concentrating grade at a distance of 493', and can be driven to obtain a 2,000' back. Tunnel has a single track, practically reaching the Coronado Railroad, which will allow advantageous shipments. Management is good and property is regarded as promising.

CHATHAM COPPER CO.

NEW MEXICO.

Mine office: Silver City, Grant Co., N. M. J. W. Carter, assignee. Lands include the Virginia mine in the Burro Mountains, and a smelter at Silver City, blown in May, 1904.

CHAUTAUQUA MINING CO.

CALIFORNIA.

Office: Jamestown, N. Y. Mine office: Manvel, San Bernardino Co., Cal.

CHAVEZ MINE.

NEW MEXICO.

Mine office: Riley, Socorro county, New Mexico. A prospect.

CHELAN COPPER CO.

WASHINGTON.

Said to own the Texas Jack copper claims, in Upper Horseshoe Basin, Washington. Vein claimed to be 30' between walls, in places, with pay-streak of about 20' carrying copper and silver values.

CHELAN TRANSPORTATION & SMELTING CO.

WASHINGTON.

Office: Chelan, Chelan Co., Wash. R. D. Johnson, general manager. Has an electric line to the Holden mine, and is completing a 300-ton smelter. Has contracted to smelt 200 tons daily for the Holden.

CHENIUS FALLS COPPER MINING CO.

WASHINGTON.

Mine office: Fairfax, Pierce Co., Wash. Incorporated July, 1902, with capitalization \$1,000,000, by F. C. Robinson et al, of Spokane, Wash. Lands, 2 claims on the Chenius river, about 7 miles from Fairfax.

CHETICAMP COPPER CO., LTD.

NOVA SCOTIA.

Office: Halifax, Nova Scotia. Mine office: Cheticamp, Cape Breton, N. S. Organized 1904, under laws of Nova Scotia, with capitalization \$2,000,000, shares \$1 par. J. J. Stewart, president; John W. Regan, secretary-treasurer; W. H. Strachan, auditor. Is the successor of the Eastern National Copper Co. Lands, 150 acres, held under government lease expiring 1980, also 200 acres of mill and smelter sites, and 200 acres miscellaneous lands, including water frontage at Cheticamp Harbor. Country rocks are micaceous schists, showing ores carried in a mineralized zone about 375' in width by 1½ miles in length, carrying estimated average values of 3.5% copper; 4 oz. to 6 oz. silver and \$2 to \$4 gold per ton, mainly from sulphide ores, with oxides and carbonates near surface. Deepest opening is 90' and a large amount of ore has been exposed. Company plans extensive underground development and installation of steam and air power and a small trial concentrator during 1905, and also may test ground by diamond drill. Management good and property regarded as promising.

CHEWELAH COPPER CO.**WASHINGTON.**

Office: care of J. H. Long, president, Spokane, Wash. S. D. Domer, secretary. Said to be developing sundry copper claims, presumably in vicinity of Chewelah, Stevens county, Washington.

CHEWELAH COPPER KING MINING CO.**WASHINGTON.**

Mine office: Chewelah, Stevens Co., Wash. Has a 1,300' main tunnel, with about 3,500' of underground openings, showing ore assaying \$14 to \$40 per ton, mainly in copper.

CHIAPAS MINING CO.**MEXICO.**

Offices: 35 Queen Victoria St., London, E. C., Eng. Mine office: Teapa, Tabasco, Mexico. C. G. Hale, chairman; Don P. Maldonado, managing director; Wm. J. Oates, mine manager; G. A. V. Narraway, liquidator. -Organized April 26, 1889, with capitalization £252,500, shares £1 par; issued, £233,061. Preference dividends in arrears since September, 1899, two years arrears having been paid in 1903. Lands, about 50 acres, including the Santa Fé mine, producing gold, silver and copper. Main shaft, 200'; tunnel, 1,560'. Has water power, 30-stamp mill, 100-ton concentrator and 75-ton smelter. Production in 1903 was 168,050 kgs. of copper. Is being wound up.

CHICAGO-ALGOMA NICKEL CO.**ONTARIO.**

Letter returned unclaimed from former mine office, Sudbury, Algoma, Ont. Lands are opened by shafts, showing cupriferous and nickeliferous pyrrhotite. Idle.

CHICAGO & ARIZONA MINE.**ARIZONA.**

Letter returned unclaimed from former mine office, Dos Cabezos, Cochise Co., Ariz. Thos. D. Chattman, president; P. B. Soto, secretary-treasurer. Capitalization \$200,000, shares \$1 par. Lands, 210 acres. Has an ore body, apparently of good size, giving assays of \$7 to \$20 per ton in copper, silver and gold. Property said to be under bond to John Brockman.

CHICAGO-BRITISH COLUMBIA MINING CO.**BRITISH COLUMBIA.**

Office: Chicago, Ill. Mine office: Greenwood, B. C. Organized 1901, with capitalization \$2,000,000, shares \$1 par. Wm. L. Springer, president; Nicholas Kuhnien, treasurer; Geo. W. Raithel, secretary; H. H. Shallenberger, manager. Lands, 177 acres, about midway between the Granby and British Columbia mines, opened by a 165' 2-compartment vertical shaft, with 75' of crosscuts, exposing good ore. Has steam power and 6x8" Jenckes hoist.

CHICAGO COPPER CO.**COLORADO.**

Mine office: Salida, Chaffee Co., Colo. Chas. Peck, manager. Lands, 7 claims, on which development work has shown ore giving good assays.

CHICAGO COPPER REFINING CO.**ILLINOIS.**

Office and works: Blue Island, Cook Co., Ills. Company has a small smelter and makes a specialty of refining copper ores rich in gold and silver, and also handles copper ores and mattes containing platinum and other rare metals.

CHICAGO & KOOTENAY MINING CO.**BRITISH COLUMBIA.**

Letter returned unclaimed from Hall, Yale & Cariboo district, B. C.

CHICAGO-LA SAL GOLD & COPPER CO.**UTAH.**

Letter returned unclaimed from former mine office, La Sal, Grand county, Utah.

CHICAGO MINING & MILLING CO.**UTAH.**

Office: care of Fred T. McGurrin, secretary, Salt Lake City, Utah. Organized 1904, with capitalization \$150,000, shares \$1 par. Thos. Keeley, president. Lands, include the Wild Bill group of claims, in Beaver county, Utah.

CHICAGO NICKEL CO.**ONTARIO.**

Owens prospects in Drury Twp., Algoma district, near Worthington, Ont., showing copper-nickel-iron ores. Idle at last accounts.

CHICAGO & PATAGONIA COPPER & GOLD MINING CO.**ARIZONA.**

Office and mine: Nogales, Santa Cruz Co., Ariz. Organized January, 1904, with capitalization \$250,000 by Joseph Korzeniewski, et al, of Chicago. Lands, probably in the Patagonia district.

CHICAGO-VENTURE MINING CO.**WYOMING.**

Office and mine: Encampment, Carbon Co., Wyo. Idle. Robt. H. Young, president and general manager; S. A. McCoy, secretary and treasurer. Organized 1901, under laws of Wyoming, with capitalization \$1,000,000, shares \$1 par. Lands, 5 patented claims, area 100 acres, showing 2 fissure veins in limestone, near a grano-diorite contact, of which one, averaging 15' width, is developed by shafts of 60' and 200' and tunnels of 50' and 60'.

CHICAGO & YELLOW METALS MINE.**WASHINGTON.**

Lands, about 20 claims, showing gold copper ores, on the extension of the Norway-Sweden-Denmark belt, in the valley of the North Toutle river, near Mt. St. Helens, Washington.

CHILCAT GOLD & COPPER CO.**ALASKA.**

Lands, 168 claims, on Big Salmon river, near Haines Mission, Alaska.

J. K. CHILD & CO.**BOLIVIA.**

Office and mines: Coro Coro, La Paz, Bolivia. Firm operates mines of native copper in the conglomerate strata of Coro Coro. Annual production is about 600 tons of barillas de cobre (unsmelted copper mineral), averaging about 80% in copper tenor. Employ about 200 men.

CHILE COPPER SULPHATE SYNDICATE, LTD.**CHILE.**

Offices: 101, Leadenhall St., London, E. C., Eng. J. E. G. Hadath, secretary. Lands are leased to Capaquire Copper Sulphate Co., Ltd.

SOCIEDAD CHILENA DE FUNDICIONES.**CHILE.**

Office: Santiago de Chile. Mines and works office: Tongoy, Ovalle, Chile. Operates the Tongoy mine, opened 1860, making about 700 tons of refined copper yearly; also the Guayacan mine, opened 1856, and producing about 800 tons annually. Has smelting plants at both mines, these buying custom ores also, and employs several hundred men.

SOCIEDAD UNION MINERA CHILENA.**CHILE.**

A Chilean company, operating the Condesa and Union mines, at Cobija, Tocopilla, Antofagasta, Chile.

CHILLAGOE BLOCKS. (NO LIABILITY.)**AUSTRALIA.**

Offices: 47, Queen St., Melbourne, Victoria, Australia. Mine office: Herberton, Queensland, Australia. W. W. Nicholas, chairman; Thos. Rollinson, secretary; W. L. Archer, mine manager. Capital, nominal, £250,000. Property is sundry claims in North Queensland, showing tin and copper ores.

CHILLAGOE COPPER PROPRIETARY, LTD. AUSTRALIA.

Dissolved December 26, 1902.

CHILLAGOE RAILWAY & MINES, LTD. AUSTRALIA.

Reorganized as New Chillagoe Railway & Mines, Ltd.

CHIPPEWA COPPER MINING CO. WISCONSIN.

Reorganized as the Corona Copper Mining Co.

CHIRICAHUA DEVELOPMENT CO. ARIZONA.

Office: Marquette, Mich. Mine office: Paradise, Cochise Co., Ariz. Organized 1903, under laws of Arizona, with capitalization \$200,000, shares \$10 par. Nathan M. Kaufman, president; Samuel R. Kaufman, secretary; Jas. H. Knowles, general manager; preceding officers, Thos. F. Cole and Wm. G. Rice, directors. Lands, 23 claims, area 460 acres, operated by former owner, Capt. Thos. Burns, as a silver mine, until taken over by present company, April, 1903.

Development is by tunnel and shafts. The 750' crosscut tunnel tapped the ledge at a depth of 280' by a 100' winze sunk 700' from the portal. The ledge in the tunnel shows about 50' of leached ore, apparently the apex of a good sulphide ore body. The 400' Mars shaft is sunk at an incline, running under a heavy gossan capping of 150' to 200' width, passing through limestone much disturbed and showing leached ore in the upper part, and at the bottom considerable chalcopyrite assaying 2% to 4% copper. About 3,000' distant from the Mars is the 3-compartment vertical Planet shaft, about 400' in depth, and drifting on the fourth level to intercept the ore body encountered in the Mars shaft. Machinery equipment includes two 2,000' double-drum Lake Shore hoists, two 150-h. p. boilers, 20-drill air compressor, power drills, pumps, etc., with necessary mine buildings. Nearest railroad is the El Paso & Southwestern, at Rodeo, 16 miles distant, which will build to the mine when assured tonnage to warrant construction. The management of this company is composed of experienced and successful mining men, and developments are of a very promising nature, geological conditions being much the same as at Bisbee, which is the nearest copper camp.

MINAS LA CHIRIPA y ANEXAS. MEXICO.

Mine office: Zimipán, Hidalgo, Mex. Leon Lamaire y Ca., owners. Ores carry silver, lead and copper. Employ about 100 men.

CHITTNA EXPLORATION CO. ALASKA.

A New Jersey corporation, address not learned. Property claimed is the Nicholai group of native copper claims, on the head waters of the Chittna river, Copper River district, Alaska, about 185 miles inland from Valdez, and the Bonanza group, claimed also by the Alaska Copper & Coal Co., and the Copper River Mining Co., with property actually held by the Alaska Copper & Coal Co.

CHLORIDE GOLD MINING CO. ARIZONA.

Mine office: Chloride, Mohave Co., Ariz. L. Hoffman, manager. Ores carry gold, silver and copper. Has steam power.

CHOIX CONSOLIDATED MINING CO. MEXICO.

Office: 43 Exchange Pl., New York, N. Y. Business office: 516 Grant Bldg., Los Angeles, Cal. Mine office: Choix, Sinaloa, Mexico. Idle. R. A. Thomas, president; Thos. E. Metcalf, vice-president; J. R. Thomas,

secretary; J. A. Mackechnie, general manager. Organized May, 1905, under laws of Mexico, with capitalization \$5,000,000, shares \$1 par; unissued, \$1,878,458. Lands, 471 pertenencias, area 1,177.5 acres, also several mill and smelter sites in the Choix district of Sinaloa and the Urique district of Chihuahua. Shipments of 1,062 tons of ore, December, 1900, to February, 1902, inclusive, to the Aguascalientes smelters, gave returns ranging from 19.5% up to 28% copper, with gross values of \$127,915.44 and net values of \$47,940.61. Lands are on both sides of the Fuerte river, and on the line of the Kansas City, Mexico & Orient R. R., now being built to Topolobampo, and at present only 30 miles from the mines. Ore bodies are said to measure from 50' to 300' in width, occurring as contacts between porphyry, diorite and limestone. Also has some gold mines, occurring as fissures in granite and quartzite. Properties include a number of antiguas and when the railroad is completed to the mines, they should be able to produce to advantage. Ore shipped 1900 to 1902 was packed on burros to Topolobampo, and sent thence to Guaymas by steam, thence by rail to Nogales and El Paso and thence to the smelters at Aguascalientes, a distance of nearly 2,000 miles, notwithstanding which a good profit was secured. Lands are owned outright, and the company is free from debt. Property apparently is one of much promise.

**COMPANIA MINERA y BENEFICIADORA
DE METALES DE CHOIX.**

MEXICO.

Mine office: Choix, Sinaloa, Mexico. F. A. Mendoza, manager. Operates Los Planatos mines, producing copper and silver

CHOTA NAGPUR MINES.

INDIA.

At Chota Nagpur, Bengal, India. Were worked in very ancient days. Ore occurs as chalcopryrite, disseminated in schistose rocks. A local company did a little development work on the property, circa 1902-1903.

CHTASTIE MINE.

BULGARIA.

Office: care of MM. Stojanoff, Varbanoff & Co., Plevna, Bulgaria. Mine office: Belogradchik, Vidin, Bulgaria. Lands, 250 hectares, held under lease from the principality, showing 2 fissures, averaging 2.5' width and 600' length, carrying chalcopryrite assaying 18% copper, 8 oz. silver and 2 dwts. gold per ton. Has 3 shafts, deepest 260' and 15 short tunnels, with about 5,000 tons of ore in sight.

CIENGUITA COPPER CO.

MEXICO.

Office: 1303-25 Broad St., New York. Mine office: Minas de Cienguita, Sahuaripa, Sonora, Mexico. Employs 300 men. Organized May 8, 1901, under laws of Arizona with capitalization \$10,000,000, shares \$10 par; unissued, \$3,586,380. On December 1, 1904, had \$23,492.96 cash on hand. Geo. Beebe, president and general manager; C. W. Wilhelm, secretary and treasurer; Frank Fitz, general superintendent; Jesse Scobey, assistant superintendent. Lands, 937 pertenencias, area 2,347 acres, with 15,000 acres of timber lands, in the Sahuaripa district, all fairly watered and timbered. Property includes the Mina Real de la Tayapa, a heavy producer in olden days, and the Minas Real de las Cienguitas. Country rocks are granite, porphyry, diorite and quartzite, ores occurring as contacts between quartzite

and granite. Development is by shafts of 125' and 136', and by 18 tunnels of 35' to 1,200' in length, principal tunnels being 400', 450', 500', 800', 1,150' and 1,200', giving a total of about 8,000' of underground openings, estimated to put 2,000,000 tons of ore in sight, with 300,000 tons blocked out for stoping. Veins are of practically vertical dip and 13 ore bodies have been located, 5 of which are being developed, these ranging from 3' to 60' in width and being traceable up to 3 miles in length, in one case, and opened to depth of 830' by one tunnel, the veins carrying sulphide ores giving estimated average values of 5% copper, 70 oz. silver and \$3 gold per ton. Has a 100-h. p. steam plant and a 6-drill air compressor at the mine, with 30x60' stone machine shop, assay office, store, enginehouse, sawmill, etc., and 120 dwellings for workmen.

Smelter is a quarter mile from the principal tunnel, receiving ore by tram-car, and has 2 reverberatory furnaces of 70 tons aggregate daily capacity. Fuel is wood, costing \$3 per cord. Smelter is to have 5 new 15x57' reverberatory furnaces in 1905, burning wood, of which two are planned to be completed in May, after which work on three additional reverberatories will be begun at once.

Property unquestionably is of value, but is poorly located as to transportation facilities, and company's estimates of production and profits seem unduly optimistic. Mr. Beebe, the president, is a mining man of experience and standing, and the other officers are well spoken of in their respective communities. The enterprise is regarded as legitimate and having fair prospects of success, although, as before stated, too much is claimed for it by the officials.

COMPANIA MINERA DE LA CIENGUIA.

MEXICO.

Mine office: Tarachi, Sonora, Mexico. Geo. Greene, manager. Operates the Tajo, Chipiona and other mines, opened by tunnels and producing gold, silver and copper.

CINCINNATI CONSOLIDATED MINING CO.

UTAH.

Office: care of A. Hanauer, Salt Lake City, Utah. Lands are in Beaver county, Utah. Not a producer, and refuses to give any statement.

CIRCUMSTANCE GOLD & MINING CO.

ARIZONA.

Mine office: Huron, Yavapai Co., Ariz. J. W. Nelson, superintendent.

CLAIRE COPPER CO.

IDAHO.

Mine office: Montpelier, Bear Lake Co., Idaho. G. C. Gray, president and treasurer; A. D. Young, secretary. Organized Sept. 16, 1902, under laws of Idaho, with capitalization \$200,000, shares 50c. par; unissued, \$44,000. Lands, 3 claims, area 60 acres, in an unorganized mining district of Bear Lake county. Veins occur as fissures in sandstone and as contacts between limestone and porphyry, giving ores assaying 4.6% copper, 10 oz. silver and about \$1 gold, from a 12" vein carrying cuprite, melaconite, diopside and chrysocolla, opened by tunnels of 100' and 200'.

CLAIRMONT MINE.

MONTANA.

Mine office: Stevensville, Ravalli Co., Mont. Amos Buck & Co., owners. A prospect having a limited amount of development work only.

CLARA COPPER MINE.

UTAH.

Lands are in vicinity of Thompson's Springs, Grand Co., Utah. Own-

ers were said to plan installing a \$40,000 leaching plant, using the process of the American Metals Extraction Co.

CLARA ST. DORA COPPER MINING CO.

AUSTRALIA.

Offices: 142 Palmerston Bldgs., London, E. C., England, and Adelaide, South Australia. T. J. Chaney, manager. Lands, 160 acres, 32 miles west of Hergott Springs, South Australia. Mine is opened mainly by shallow shafts and open-cuts showing malachite and chalcocite, occurring as nodules in hard limestone and as veins in soft limestone. Has steam power and employed about 100 men at last accounts.

CLARK MINE.

MICHIGAN.

Owned by Edouard A. J. Estivant, Paris, France. Is an old property, carrying native copper and pyrolusite. Area, about 2,500 acres, located south of Copper Harbor, Keweenaw county, Mich. Opened 1858; idle for many years. Total production, 93 tons 1,915 lbs. fine copper.

CLARK CONSOLIDATED MINING CO.

ARIZONA.

Office and mine: Douglas, Cochise Co., Ariz. J. R. Clark, president; R. H. Skiles, secretary and treasurer; W. H. McIvens, manager. Lands, 10 claims, about 10 miles east of Douglas, showing veins of 3' to 10' width, carrying ores of copper, lead, silver and gold, assaying up to 8% copper, with \$30 to \$35 gold, silver and lead per ton, opened by 60' shaft.

KÖNIGLICHE HÜTTENAMT CLAUSTHAL.

GERMANY.

Works office: Clausthal, Hanover, Germany. Herr Bergrat Boltze, manager. Property is a silver-copper smelter, operated under state auspices.

CLAYTON MINING & SMELTING CO.

IDAHO.

Mine office: Clayton, Custer Co., Idaho. Lawrence Greene, general manager. Lands, 18 claims. Ores carry silver, lead and copper. Has water and steam power and a 50-ton smelter, employing about 50 men.

CLEAR CREEK MINING & REDUCTION CO.

COLORADO.

Mine office: Russell Gulch, Gilpin Co., Colo. F. R. Carter, superintendent. Property is the Saratoga mine, carrying ores of gold, silver and copper. Has steam and electric power and also owns a pyritic smelter at Golden, Colo.

CLEOPATRA GROUP.

OREGON & CALIFORNIA.

Sundry claims in Josephine Co., Oregon, and Del Norte Co., California, owned by J. S. Crawford and F. H. Osgood, of Seattle. Lands, 45 claims and a 40-acre millsite, showing good copper ores and masses of native copper weighing up to several hundred pounds. District is isolated and difficult of access, but property is regarded as promising if given rail connection.

CLEOPATRA COPPER CO.

ARIZONA.

Office and mine: Jerome, Yavapai Co., Ariz. Organized 1902, under laws of Arizona, with capitalization \$4,000,000, shares \$1 par; stock mainly held in Europe. G. W. Hull, president and general manager; H. E. Wilcox, secretary. Lands, 13 claims, 11 patented, area about 180 acres, in the Verde district, showing 8 fissures and gash veins, of which several are being developed, these running 1' to 5' in width and giving oxide, carbonate and sulphide ores assaying 1% to 65% copper, and 1 oz. to 500 oz. silver, with good gold values. Has several shafts, deepest 75', and five tunnels, No. 2 being 1,350' long. Has steam power and air compressor.

CLEVELAND-ARIZONA COPPER CO.**ARIZONA.**

Supposed to have copper claims near Ajo Basin, Arizona.

CLIFF MINE.**MICHIGAN.**

The oldest mine in the Lake Superior district. Was a considerable dividend payer until suspension in 1879. Now owned by Tamarack Mining Company.

CLIFTON-ARIZONA COPPER CO., LTD.**ARIZONA.**

Succeeded by Clifton Consolidated Copper Mines of Arizona, Ltd.

CLIFTON CONSOLIDATED COPPER MINES OF ARIZONA, LTD. ARIZONA.

Absorbed, 1903, by New England & Clifton Copper Mines of Arizona.

CLIFTON COPPER CO.**NEW MEXICO.**

Office: Deming, N. M. Mine office: Santa Rita, Grant Co., N. M. Organized 1900, with capitalization \$500,000, shares \$5 par. J. L. Burnside, president; F. F. Rogers, secretary; M. M. Z. Elliott, superintendent. Lands are in the Central district of Grant county, with 5 shafts, deepest 235', showing an ore body said to be 40' to 50' wide and a half-mile long, carrying oxide, carbonate and sulphide ores with occasional native copper. Ore is of concentrating grade, with occasional high-grade paystreaks. Mine shows considerable ore ready for stoping. Has steam hoists and a 65-ton concentrator with 2 Huntington mills, 2 Wilfly tables and 2 Standard concentrators. Property was in litigation for some time, but a satisfactory settlement was reached October, 1903.

CLIFTON COPPER MINING CO.

Promoted, 1898, by Julius Leszynsky, of New York. Financial operations were not of a sort to appeal to conservative investors. Present address of company not learned, and location of lands, if any, unknown.

CLIFTON COPPER BELT MINING CO.**UTAH.**

Office: 24-65 West Second South St., Salt Lake City, Utah. Mine office: Deep Creek, Utah. Clyde H. Wilson, president; Frank L. Wilson, secretary, treasurer and general manager. Capitalization \$25,000, shares 5c par. Has secured assays of 35.5% copper, 9 oz. silver and \$1.20 gold per ton.

CLIFTON TINTO COPPER MINES, LTD.

Voluntarily wound up, March, 1903.

CLIMAX MINING CO.**COLORADO.**

Mine office: Granite, Chaffee Co., Colo. B. H. Pelton, president. Property is the Spondulix mine, carrying ores of gold, silver and copper.

CLIMAX MINING CO.**COLORADO.**

Mine office: Ouray, Ouray, Co., Colo. F. O. Seabury, manager. Property is the Silver Link mine, carrying ores of gold, silver and copper. Has steam and gasoline power and employed about 20 men at last accounts.

CLIMAX MINING CO.**WASHINGTON.**

Mine office: Baring, King Co., Wash. Frank P. Smith, superintendent. Lands, 8 claims, with 200' tunnel and surface trenches, showing bornite and chalcopryrite giving good assay values in gold, silver and copper.

CLUIN COPPER DEVELOPMENT SYNDICATE, LTD.**IRELAND.**

Registered Aug. 26, 1904, with capitalization £10,000, to adopt an agreement with Berehaven Copper Mines, Ltd.

CLUSTER MINING CO.**UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. Lands are located between the Bingham Consolidated and United States mines. Management planned to develop property by a 1,000' tunnel. No recent returns.

COAHUILA MINING & SMELTING CO., LTD.**MEXICO.**

Office: Apartado 72, Monterey, N. L., Mex. Mine office: Viesca, Coahuila, Mex. Employs about 500 men. G. F. Meehan, president; Frank J. Llewellyn, vice-president; Walter E. Parker, secretary and general manager; F. W. Draper, superintendent. Operates the Santa Maria, Sultana and other mines, carrying ores of copper, gold, silver and lead, opened by a 700' main shaft and a 1,000' main tunnel. Has steam and electric power and a 250-ton smelter, blown in early in 1903, smelter and mines being connected by railroad. Is conducted as a close corporation company, making no returns in response to questions. The general manager states that the company is increasing its cash surplus. Smelter is said not to have been operated regularly. Production in 1903 was 178,865 lbs. refined copper.

COAST LINE COPPER CO.**MEXICO.**

Office: La Calera, Altar, Sonora, Mex. John T. Cave, president; Judson A. Elliott, secretary; John Henderson, general manager. Organized, 1902, as successor to the Porvenir de Sonora company. Lands, include a gold property, 14 miles from Pozo, in the Ures district, and a copper property, formerly a profitable silver producer, in the Altar district.

COAST RANGE COPPER CO.

Incorporated January 16, 1903, at Roseburg, Ore., with capitalization \$25,000 in 500 shares, par \$50, by T. R. Sheridan et al., to transact a general mining business.

COBAR CHESNEY & GOLD MINING CO.**AUSTRALIA.**

Mine office: Cobar, Robinson Co., N. S. W., Australia. Employs about 100 men. J. Woolcock, manager. Was opened as a gold mine, the outcrop carrying no copper, but carbonate ores were found at depth of 155', and at 250' depth chalcoppyrite coated with melaconite come into the shaft in considerable quantities. Main shaft is about 600' in depth, with ore carrying 3% to 8% copper and about 3 dwts. gold per ton, showing one 35' ore body, averaging 3% copper for a length of 800'. Has steam power, 10-stamp mill and 25-ton concentrator, ore and concentrates being smelted at the Great Cobar works. Produces about 150 tons of refined copper yearly. Concentration process has not proven a success, ores averaging about 3% only.

COBRE MINING CO.**ARIZONA.**

Same as Del Cobre Consolidated Co.

COBRE GRANDE COPPER CO.**MEXICO.**

Absorbed by Cananea Cons. Copper Co., now Greene Cons. Copper Co.

COMPANIA COBRIZA.**MEXICO.**

Letter returned unclaimed from former mine office, Tepezalá, Aguascalientes, Mex.

MINA LA COBRIZA.**MEXICO.**

Mine office: Matehuala, San Louis Potosi, Mex. Zalasár, Nerezo & Gonzales, owners. Zepuno Zalasár, superintendent. Produces silver, gold and copper. Mine is opened by tunnels and employed about 100 men at last accounts.

COMPANIA MINERA COBRIZA y ANEXAS.**MEXICO.**

Mine office: Alamos, Sonora, Mexico. Manuel Salazar y Perron, manager. Ores carry gold, silver and copper. Mine is opened by shafts and tunnels. Employed a small force in development work at last accounts.

COCHISE CONSOLIDATED COPPER CO.**ARIZONA.**

Office: care of C. B. James, secretary, treasurer and general manager, Scranton, Pa. Mine office: Paradise, Cochise Co., Ariz. Capitalization \$5,000,000, shares \$1 par. Henry Alexander, president; W. C. Hagan, vice-president; Howard H. Douglas, consulting engineer; Harry Holburn, superintendent. Lands, 17 claims, including 12 claims known as the Davis group, bonded for \$82,500, which are being paid for at the rate of \$5,000 per month. The Ainsworth shaft on the Mascot claim is sunk at an incline of 60°. The Treasure shaft shows a 4' vein giving average assay values of \$75 to \$140 per ton in copper, silver and gold. The Duplex two-compartment shaft is 180' in depth. Ores carry high values in copper, gold and silver, and also contain heavy percentages of zinc. Company began shipping ore to the smelters late in 1904, and is said to plan a 50-ton concentrator. Present force is about 25 men, planned to be increased to about 100.

COCHISE COPPER MINING CO.**ARIZONA.**

Office and mine: Bisbee, Cochise Co., Ariz. L. C. Shattuck, president; S. K. Williams, secretary; Jos. Muheim, superintendent. Capitalization \$5,000,000, shares \$1 par. Lands, 20 claims lying north of and adjoining the Copper Queen. Has a 300' shaft in porphyry, which has cut sundry stringers showing argentiferous and auriferous chalcopyrite. Was regarded as of little value until Junction Development Co. found ore under the conglomerate claims, but now is considered very promising.

COCHISE MINING & MILLING CO.**ARIZONA.**

Reported dead by former officers.

COCHISE PROSPECTING, MINING & DEVELOPMENT CO.**MEXICO.**

Letters returned unclaimed from former mine office, Bacoachi, Sonora, Mex. I. N. Gates, president; P. G. Sawyer, manager; Geo. Motz, superintendent. Lands, sundry claims, including the San Eufracio, opened to a depth of 250', with a quarter mile of underground openings, giving very high assays in gold and silver. Company also has exceptionally promising copper claims in the Ajo mountains, Arizpe district, Sonora, giving surface showing indicating existence of a 100' vein, from which some very rich specimens of copper ore have been secured.

COCONINO COPPER CO.**ARIZONA.**

Office: 420 Merchants Loan & Trust Bldg., Chicago, Ill. Mine office: Ryan, Coconino Co., Ariz., via Kanab, Utah. Organized 1901, under laws of New Jersey, with capitalization \$6,000,000, shares \$10 par. Donald Grant, president; L. P. Boyle, secretary; W. S. McCornick, treasurer; E. P. Jennings, general manager. Lands, 33 claims, area 660 acres, also 80 acres miscellaneous lands, showing blanket veins carrying carbonate ores estimated to average 10% copper, which are stripped and worked open-cast. Estimated amount of ore in sight is 500,000 tons, with 100,000 tons blocked out for stoping. Smelter is at Ryan, 7 miles from mine, receiving ore by wagons. Company installed a 100-ton leaching plant, using the Neill process, late in 1902.

COLDWATER COPPER MINING CO.**COLORADO.**

Office: 232 West Cedar St., Kalamazoo, Mich. Mine office: Encampment, Wyo. Employs 25 men. Z. L. Baldwin, president; E. S. Drury, vice-president; Edwin Gillis, secretary and treasurer; G. T. Keene, general manager; Joseph Montague, superintendent. Organized Dec. 11, 1899, under laws of Wyoming, with capitalization \$1,000,000, shares \$1 par. Lands, 5 claims, area about 50 acres, also 20 acres miscellaneous lands, in the Pearl district of Larimer county, Colorado. Country rocks are granite and diorite, with 3 fissure veins, of which one of 20' estimated width shows oxide and carbonate ores, and native copper, with sulphides at a little depth, estimated to carry an average of 10% copper and 8 oz. silver per ton, opened by shafts of 130' and 134' and a 275' crosscut. Property is known as the Wolverine mine, bottom of principal shaft showing massive chalcocite and a little disseminated chalcopryite of high average grade. Has steam power. Developments are regarded as promising. Property has been leased for a 3 to 5 year term to the Wolverine Leasing & Mining Co., composed of Coldwater shareholders.

SOCIEDAD COLECTIVA.**CHILE.**

Supposed to operate the Tiltill mine, department of Santiago, Chile.

COLOMBIA GOLD & COPPER CO.**COLOMBIA.**

Thos. S. Moffat, president and Pooh-Bah. Capitalization, \$125,000, shares \$10 par. Lands, sundry undeveloped government concessions in the Republic of Colombia.

MINAS COLON, RECOMPENSA y OTRAS.**MEXICO.**

Operated by Choix Consolidated Mining Co., Ltd.

COLONIAL COPPER CO.**NOVA SCOTIA & ONTARIO.**

Office: 32 Broadway, New York. Mine office: Advocate, Cumberland Co., N. S. Employs about 125 men. Organized January 19, 1899, under laws of West Virginia, with capitalization \$5,000,000, shares \$1 par. Has authorized a \$300,000 bond issue to raise working capital. J. A. Hanway, president and general manager; H. D. Hanway, secretary; A. Munger, treasurer; S. M. Archibald, superintendent. Lands, about 2,000 acres, showing 6 contact veins, of which 3 are developed, these having an average width of 25' and carrying about 2.5% copper. Has 2 vertical and one incline shaft, latter 500' in depth. Machinery outfit includes 3 Rand air compressors, 3 large and 6 small hoists, drills, etc. Has a 400-ton concentrating mill, with Blake crushers, rolls, jigs, tables, screens, etc., connected with mine, 1½ miles distant, by a 36" gauge railroad. Nearest railway is 30 miles distant, but property is located on the shore of the Bay of Fundy and receives all machinery and supplies by water. Company also owns the New Annan mine, carrying sulphide ore in lenses, and the Chandos mine in Peterboro county, Ontario, latter showing a 4' vein assaying 8% copper, but now idle. Begun building a 200-ton concentrator September, 1902. Company seems honestly managed, but is suffering from lack of needed funds, the development and equipment of a mine upon a large scale having proved much more costly than was anticipated when work was begun.

COLONIAL COPPER CORPORATION, LTD.**AUSTRALIA.**

Offices: Salisbury House, London, E. C., Eng. Works office: Lithgow,

Robinson Co., N. S. W., Australia. G. Hardie, chairman; C. P. Oswald, secretary; J. Wills, mine manager. Registered, March 29, 1899. Capital, nominal, £125,000; issued, £102,507. Lands, 245 acres. Idle, and property is to let on tribute.

MINA LA COLORADO.

MEXICO.

Mine office: care of Don Carlos Yanes, owner, San Xavier, Sonora, Mex. Was driving a tunnel to develop copper ores, at last accounts.

COLORADO-BOHEMIA MINING &

COLORADO & OREGON.

MILLING CO.

Office: 15 William St., New York, N. Y. Organized under laws of Colorado, with capitalization \$1,250,000, shares \$1 par. Albert Hawkins, president; G. B. Henzer, secretary and treasurer. Lands, sundry gold and copper claims in various districts of Oregon and Colorado.

COLORADO CONSOLIDATED MINING CO.

COLORADO.

Mine office: Cochetopa, Saguache Co., Colo. Ores carry gold, silver and copper. Has steam power and 10-stamp mill, employing about 20 men.

COLORADO COPPER CO.

A swindle, set afloat by Wm. F. Wernse & Co., 421 Olive St., St. Louis, Mo., notorious promoters of "fake" mining companies. Stock is worthless.

COLORADO COPPER SYNDICATE, LTD.

Voluntarily wound up, April, 1901.

COLORADO MINING & DEVELOPMENT CO.

MONTANA.

Title changed, 1904, to Wickes-Corbin Copper Mining Co.

COLORADO & CONNECTICUT GOLD MINING CO.

COLORADO.

Office: 35 Wall St., New York. Organized 1902, under laws of South Dakota, with capitalization \$400,000, shares \$5 par, non-assessable. Wm. Garlick, president; A. S. Garlick, secretary. Lands, 3 claims, area 21 acres, in the Galena district of Hinsdale county, Colorado. Company is prospecting three 2' fissure veins, giving assays of 9% to 19% copper, with good silver values, from chalcopyrite, tetrahedrite and occasional silver-glance. Has a 50' shaft and 800' tunnel.

COLORADO MINING & SMELTING CO.

MONTANA.

Mine office: Butte, Silver Bow Co., Mont. Capitalization \$2,500,000. Is entirely owned, except founders' shares, by the Amalgamated Copper Co. Employs about 500 men. Jas. B. Gallagher, superintendent. Lands include the Otisco and Gagnon mines, latter in the western limits of the Butte copper zone, ore from which is decidedly zinciferous and richest in silver of any Butte copper mine. The Gagnon has a 3-compartment 1,800' main shaft, sunk at an angle of 74°, with an air shaft of the same depth 700' to the westward. Has steam and electric power, with a 22x48" Dickson hoist operating 3-ton skips, and a 10-drill Rand air compressor. Mine was closed down temporarily in August, 1904 for retimbering the shaft, which was old and in bad condition.

The reduction plant, at Butte, which also did a general custom business, was closed late in 1904, but will be held in reserve for emergencies. This plant has a concentrator and furnaces with 750 tons daily capacity, but lacks converters. Ore now goes to the Butte & Boston smelter and to the Washoe plant at Anaconda. Production of refined copper for 1904 is estimated at 6,000,000 lbs.

The following table gives a summary of operations and results for the fiscal years ending June 1, 1903 and 1904:

	1903	1904
Tons of ore extracted.....	235,680	206,035
Gross yield	\$998,638	\$1,616,497
Cost of extraction	581,126	625,389
Cost of transportation.	37,693	30,905
Cost of reduction.	336,728	385,285
Total expenses	955,547	941,665
Net proceeds.	43,090	74,833

COLORADO RIVER GOLD & COPPER CO.

CALIFORNIA.

Office: 405 Mason Opera House Blk., Los Angeles, Cal. Mine office: Mellen, San Bernardino Co., Cal. E. W. Peck, president and general manager; Paul C. Thorne, secretary; E. S. Gannon, treasurer and assistant manager; Wm. T. Field, superintendent. Organized July 1, 1901, under laws of Arizona, with capitalization \$1,500,000, shares \$1 par; unissued, \$650,000. Lands, 10 claims, area 200 acres, in the Monumental district of San Bernardino county, showing 9 fissure veins or lenses, of which one is of 3' average width, opened by shafts of 50' and 100' and several short tunnels, returning average assays of 7% copper, 2 oz. silver and \$13.50 gold per ton, from malachite, chalcopryrite and pyrrhotite.

COLOSSAL GOLD & COPPER CO.

UTAH.

Organized 1902, with capitalization \$600,000, by F. F. Brown, Wallace W. Wait, et al., at Salt Lake City, Utah, to take over the C. M. C. group of claims, in Beaver county, Utah. Apparently idle.

COLUMBIA COPPER CO.

ARIZONA.

Office: 919 Chestnut St., St. Louis, Mo. Zach. W. Tinker, president; A. L. Steinmeyer, secretary; P. J. Cole, superintendent. Lands, near Globe, Gila Co., Arizona, showing argentiferous and auriferous copper ores, very slightly developed. Has steam power.

COLUMBIA COPPER MINING CO.

ARIZONA.

Merged in Consolidated King Development & Columbia Copper Co.

COLUMBIA COPPER MINING CO.

UTAH.

Property sold, 1903, to Ohio Copper Co.

COLUMBIA RIVER GOLD MINING CO.

WASHINGTON.

Mine office: Kettle Falls, Stevens Co., Wash. J. M. Fish, superintendent. Ores carry gold, silver and copper. Has steam power.

COLUMBUS CONSOLIDATED MINING CO.

UTAH.

Office: 10 Atlas Blk., Salt Lake City, Utah. Mine office: Alta, Salt Lake Co., Utah. Employs about 25 men. Anthony O. Jacobson, president and general manager; Clarence K. McCornick, vice-president; Arthur E. Snow, secretary and treasurer. Organized, 1902, under laws of Utah; capitalization increased, 1904, to \$1,500,000, shares \$5 par. Lands, 17 claims, area 275 acres, on both sides of Little Cottonwood Canyon, mainly on Old Flagstaff Hill. Lands show 9 fissure and contact veins, 6 said to average 12' width, and to carry estimated average values of 5% to 25% copper, 18% lead, 15% zinc, 14 oz silver, and \$1 gold per ton. Principal ore bodies are fissures and contacts in limestone and quartzite, with highly mineralized sections

ranging 30' to 100' wide for several hundred feet in distance. Ores are carbonates on surface, and sulphides at depth. Shipping ore runs \$10 to \$60 per ton, carrying 5% to 25% copper, 25% to 50% lead, and 10 oz. to 100 oz. silver per ton. Concentrating ores are reduced 4 or 5 into 1, and 327 tons of concentrates made in 1904 averaged \$21.39 in value. Mine is opened by 4 shallow shafts and 3 tunnels, longest 900'. The Holland and Columbus tunnels are connected by a drift-crosscut on the Braine fissure, giving ventilation, and the Holland tunnel has electric traction.

Machinery plant is actuated by electricity. Power is secured from a Felton wheel, working under a head of 494', water being delivered through 4,500' of 20" and 22" steel pipe, developing 660 h. p., which is transformed into electricity by two 3,000-kw. dynamos and carried to the mine by a 4½-mile transmission line. Foundations are in for another wheel of the same size. The mine has a 700' Nordberg compressor, of about 10-drill capacity.

A 100-ton concentrator was completed Nov. 1, 1904, but has been unable to run, except experimentally, owing to shortage of water, 1904 having been the dryest season known in Utah for many years. Ample water will be available in the spring of 1905. The mill was built from the material secured out of two old 100-ton mills, these being the Tesora mill at Tintic, and the Weber-Kearns mill at Park City. Mill has a Gates gyratory crusher, 2 sets of rolls, 3-compartment jigs and 6 Wilfley tables.

An assessment of \$56,400 was levied in August, 1904, and another of similar size will be levied early in 1905, as additional funds are much needed. Management is good and property considered valuable.

COLUSA-PARROT MINING & SMELTING CO.

MONTANA.

Office and mine: 10 West Broadway, Butte, Silver Bow Co., Mont. Hon. Wm. A. Clark, president; A. H. Wethey, vice-president and general manager; Wm. Bickford, secretary. Preceding officers, A. J. Johnston and C. E. McBloom, directors. Organized Nov. 26, 1897, with capitalization \$500,000, shares \$50 par, full paid. Has paid dividends to close of 1904 of \$1,440,000. Lands include the Colusa-Parrot, East Stewart, West Stewart, Dives, Woolman and Home mines. The 2-compartment main shaft on the Original is 1,400' in depth. The East Stewart has a 1,300' 3-compartment incline shaft, with 120' steel gallows-frame. The West Stewart has an 1,100' shaft, with 120' steel gallows-frame. The Original and West Stewart mines have duplicate 32x72" Nordberg hoists and the Original has two 50-drill Ingersoll-Seargeant air compressors, operated by two 500-h. p. induction motors, taking power from the Canyon Ferry plant. Mines are connected underground with adjoining properties.

The wooden concentrator, at Butte, commonly known as the Butte Reduction Works, was rebuilt 1902, with a daily capacity of 1,000 tons. The equipment includes one 15x24" crusher and five 9x15" crushers of the Blake type; seven 6' Chilean mills; nine 16x30" rolls; 63 2-compartment jigs of the Hartz type, and 56 Wilfley tables. The smelter is 1½ miles from the mines, receiving ore by tramway, and is of 500 tons daily capacity. Equipment includes 5 Wethey and 2 MacDougal calciners, two 150-ton blast furnaces, and three 80-ton reverberatory furnaces. Product is a matte carrying 55% copper, 75 oz. silver and \$2 gold per ton, shipped to the Nichols Chemical

Works on Long Island for refining. Production of the Colusa-Parrot was 19,500,000 lbs. refined copper in 1902, and 20,500,000 lbs. each for 1903 and 1904.

COMANCHE MINING & SMELTING CO.**NEW MEXICO.**

Office: 602 Goldsmith Bldg., Milwaukee, Wis. Mine office: Silver City, Grant Co., N. M. Organized 1902, under laws of Arizona, with capitalization \$5,000,000, shares \$1 par. S. S. Curry, president and treasurer; Thos. G. Atkinson, vice-president; Chas. J. Laughren, secretary and general manager; Henry W. Edwards, superintendent; Victor Viderton, mine superintendent. Lands, 38 claims, area 760 acres, including the Pinos Altos mines, bought of the Hearst estate, in the Burro Mountains, 13 miles from Silver City. The Burro Mountain group shows 3 lenses and the Pinos Altos group 4 fissure veins, carrying cuprite, malachite, azurite and chrysocolla, the Burro Mountain group giving average assays of 5% to 8% copper, without gold or silver values, while the Pinos Altos shows sulphide ores, assaying 3% copper, 15 oz. silver and 0.33 oz. gold. per ton. The Burro Mountain ores are oxides, carbonates and silicates, with indications of sulphides at the present bottom of the mine.

The Pinos Altos mines are extensively developed and were considerable producers for years when owned by the late Senator Hearst. The Gillette shaft is 1,000' deep, and there are 3 other shafts of 400' to 800' depth. The Burro Mountain properties scarcely have advanced beyond the stage of decidedly promising prospects. The Pinos Altos group has large bodies of low-grade ore developed, which are expected to yield a fair margin of profit when worked with modern facilities upon a large scale. Ore is shipped by rail and wagon to the smelter.

The reduction plant at Silver City was burned June, 1903, throwing back the Comanche company about 18 months. The rebuilt plant has three small blast furnaces and a larger one under construction, also a modern reverberatory furnace, with roasters, etc. Electric power is used and the smelter has a machine shop and smithy in connection, also office building and dwellings for employees. Total capacity of plant is 200 to 250 tons daily, and about 75 tons of custom ore is smelted daily, pending beginning of production by company's own mines. Product is said by company to be blister copper averaging 98% copper, 150 oz. silver and 10 oz. gold per ton. The works also have a concentrator with magnetic separators for removing zinc, excess of which caused suspension of mining at the Pinos Altos.

In addition to the mines, the Pinos Altos estate includes extensive landed holdings, with ranches, orchards, the town of Pinos Altos, a general store, etc. The Silver City smelter enjoys a good custom smelting business, being favorably located for treating ores from a district of many thousand square miles in western New Mexico and southeastern Arizona. Management is composed of men of good standing, and Mr. Curry is one of the most experienced mining men of Lake Superior, with a record of forty years of clean and highly successful mining, while the Pinos Altos is a property of assured merit and the Burro Mountain group is decidedly promising.

COMMERCE GOLD & SILVER MINING CO.**ARIZONA.**

Letter returned unclaimed from Duncan, Graham Co., Ariz.

COMMODORE COPPER MINING CO.**WYOMING.**

Letter returned unclaimed from former mine office, Encampment, Carbon Co., Wyo.

COMMODORE MINES, LTD.**BRITISH COLUMBIA.**

Letter returned from advertised office, Vancouver, B. C. Capitalization \$750,000. Jas. R. Webster, president; W. H. Pegram, secretary.

COMSTOCK MINE.**MONTANA.**

Mine office: Basin, Jefferson Co., Montana.

COMSTOCK MINING CO.**WYOMING.**

Office and mine: P. O. Box 132, Encampment, Carbon Co., Wyo. Wm. Norell, president and general manager; C. B. Bergquist, secretary. Organized Oct. 1, 1900, under laws of Wyoming, with capitalization \$1,000,000, shares \$1 par; unissued, \$442,150. Lands, 5 claims, area 103 acres, also a 20-acre millsite, in the Battle Lake district, showing 4 fissure veins, of which 2, averaging 16' width and giving assays of 15% copper, 20 oz. silver and \$3.15 gold per ton, have been cut by a 250' tunnel.

COMSTOCK & TASMAN LYELL, CONSOLIDATED.**TASMANIA.**

Has lands, partly prospected on the western slope of Mt. Lyell, Montague county, Tasmania.

MINAS LAS CONCAVAS.**COSTA RICA.**

An old copper property in Costa Rica, opened in the Eighteenth Century or earlier. Now idle.

COMPANIA MINERA CONCEPCION DEL ORO.**MEXICO.**

Mine office: Concepcion del Oro, Zacatecas, Mexico. Organized 1902, with capitalization \$30,000, shares \$30 par. Santiago Chamberlain, president; J. L. Kowalski, secretary and general manager; Santiago Chamberlain, Jr., superintendent; Juan Sanchez, mining captain. Lands, 32 pertenencias, area about 80 acres, in the Mazapil district. Vein averages 4', carrying oxide ores averaging 30% copper, with gold and silver values. Shaft, 33 metres. Ore is shipped 336 miles to smelters at San Luis Potosi. Has gasoline power and employs a considerable force.

GEWERKSCHAFT CONCORDIA.**GERMANY.**

Mine office: Herdorf, Rheinprovinz, Germany. Is a very small producer of copper ore.

CONCRETE GOLD MINING CO.**COLORADO.**

Office: 324 Cooper Bldg., Denver, Colo. Mine office: Central City, Gilpin Co., Colo. Saml. V. Newell, superintendent. Ores carry gold, silver, lead and copper. Has steam power and employed about 25 men at last accounts.

CONDON MINE.**ARIZONA.**

Office and mine: Oracle, Pinal Co., Ariz. T. C. Condon, owner; Geo. E. Metz, superintendent. Has gasoline power.

COMPANIA MINERA DE CONDORIACO.**CHILE.**

Mine office. La Serena, Coquimbo, Chile. Has steam power and employs 50 to 75 men.

CONEJO-COLORADO MINING CO.**MEXICO.**

Mine office. Ocotlán, Oaxaca, Mex. F. B. Morse, manager. Produces gold, silver and copper. Mine is opened by shafts and tunnel. Has steam

power, 5 stamps, 2 Huntington mills and 30-ton cyanide plant. Employs about 100 men.

CONFEDERATE MINING CO.

ARIZONA.

Office: care of Col. Lee Crandall, Washington, D. C. Theodore Crandall, superintendent. Property is the Candelaria group, on Reno Mountain, Maricopa county, Arizona, opened by shafts of 30', 60' and 64', said to show a 12' vein of sulphide ore carrying a 4' paystreak giving assays of 20% copper.

CONGOR GOLD & COPPER MINING CO.

Office: 506 Auerbach Bldg., Salt Lake City, Utah. Location of property, if any, unknown.

CONGRESS COPPER MINING CO.

COLORADO.

Mine office: Red Mountain, Ouray Co., Colo. Geo. H. Foltz, manager. Has cupriferous gold and silver ores, opened by shafts and equipped with steam power, employing about 25 men.

CONGRESS GOLD & COPPER MINING CO.

WASHINGTON.

Office: Spokane, Wash. Joseph Roslow, president; J. Goodrich, secretary. Lands, about 80 acres, in the Keller district of Ferry county, Washington. Mine is opened by shafts and tunnels, on 2 veins giving good assay values in gold, silver and copper, with some nickel. Apparently idle.

E. P. CONNER CO.

CALIFORNIA.

Office and mine: Redding, Shasta Co., Cal.

CONQUEST CONSOLIDATED MINING CO.

WASHINGTON.

Office: 426 Postal Telegraph Bldg., New York. Mine office: Newport, Stevens Co., Wash. John H. Shaw, president; J. W. Hays, secretary. Is a consolidation of the Conquest Gold & Copper Mining & Milling Co., and the American Eagle Mining & Milling Co. Lands, 12 claims, showing 3 veins of 4' to 8' width, opened by about 2,200' of tunnels. Ore of good average grade has been uncovered in fair quantities, and considerable ore is blocked out for stoping. Has good equipment, including steam power, air compressors, etc. Officers stand well and property is of promise.

CONQUEST GOLD & COPPER MINING & MILLING CO.

WASHINGTON.

Reorganized as Conquest Consolidated Mining Co.

CONSERVATIVE MINING CO.

WASHINGTON.

Office: Snohomish, Wash. Mine office: Silverton, Snohomish Co., Wash. Frank M. Evans, president; Hugh Kennedy, secretary and manager. Idle.

CONSOLIDATED AFRICAN COPPER TRUST, LTD.

RHODESIA.

Offices: 8 Old Jewry, London, E. C., Eng. Mine office: Bulawayo, Rhodesia, South Africa. Dr. Hans Sauer, chairman; H. A. Piper, consulting engineer; H. G. Sidgreaves, secretary; Cyril E. Brackenbury, mine manager. Organized Feb. 17, 1902, with capitalization £600,000, shares £1 par; issued £474,500. Lands, 135 claims, including the Alaska mine, in the Lomagundi district of Rhodesia, also sundry valuable gold claims and right to locate all copper claims within an area of 1,242 square miles. The Alaska mine, 90 miles northwest of Salisbury and 30 miles from a railroad, shows the second largest ancient workings in Rhodesia. The ore bodies have an average width of 150' and length of 1,700'. Copper ore has been found at depth of 200' to 800' in numerous diamond drill borings. The company also has 20'

claims in Mozambique, on which copper has been shown. Management, both general and local, is excellent, and the property is regarded as possessing exceptional promise.

CONSOLIDATED COPPER CO.**BRITISH COLUMBIA.**

Former office, Ainsworth, B. C. Dead.

CONSOLIDATED COPPER CO., LTD.**CORSICA & MEXICO.**

Offices: Dashwood House, London, E. C., Eng. F. Hawdon, chairman; S. J. Crouch, secretary; Thos. P. Rowe, manager. Organized June 10, 1899, as a reorganization of the New Consolidated Mining Co., Ltd., with capitalization £100,000, shares 10s. par, 9s. 6d. paid in.; issued, £92,500. Lands include La Bufa de Charcas claims, carrying copper, silver and lead ores, in the state of San Luis Potosi, Mexico, and sundry adjoining claims; also the Lacone copper mines, in Corsica, on which work was suspended several years ago.

CONSOLIDATED COPPER CO. OF PARRY SOUND.**ONTARIO.**

Office: Duluth, Minn. Property, sundry lands in the Parry Sound district of Ontario, including former holdings of the Hattie Belle Gold, Copper & Nickel Co. Is asserted to have 4,000,000 tons of ore in sight, claimed to carry net values of \$10 to \$15 per ton. Idle at last accounts.

CONSOLIDATED COPPER CO. OF VIRGINIA.

Office: 5 Beekman St., New York. Organized October, 1902, under laws of South Dakota, with capitalization \$100,000,000. Franklin Bien, president; Nathan E. Clark, secretary. Location of company's lands, if any, unknown. Probably a blanket incorporation for some big copper consolidation that was not accomplished.

CONSOLIDATED COPPER MINING CO.**IDAHO.**

Succeeded by Ladd Metals Co.

CONSOLIDATED COPPER MINING, MILLING**COLORADO.****& SMELTING CO.**

Office: 417 Temple Court, Denver, Colo. Mine office: Eldora, Boulder Co., Colo. Employs 20 men. Organized 1899, under laws of Colorado, with capitalization \$3,000,000, shares \$1 par. J. B. Johnson, president and general manager; E. W. Kelly, secretary; K. W. Hunt, mine superintendent. Lands, 14 claims, area 130 acres, in the Grand Island district, showing 4 contact veins between granite and phonolite, one with a width of about 200' having a 3' to 20' paystreak that gives average assays of 15% copper, 15% lead, 40 oz. silver and \$20 gold per ton, from bornite and chalcopryrite. Main shaft, 360'; also a 1,350' tunnel, with about 2,500' of underground openings. Has a 100-h. p. steam equipment and 3-drill air compressor.

CONSOLIDATED GEM MINES CO.**COLORADO.**

Mine office: Idaho Springs, Clear Creek Co., Colo. W. S. Renshaw, manager. Ores carry gold, silver, lead and copper. Has steam power and 10-stamp mill, employing about 50 men.

CONSOLIDATED GOLD & COPPER CO.**ARIZONA.**

A. Douglas-Lacey Swindle. Dead.

CONSOLIDATED GOLD & COPPER MINING CO.**UTAH.**

Office: 25 Broad St., New York. Letter returned unclaimed from former mine office, La Sal, Grand Co., Utah. A. Graham Donnelly, president;

Gid R. Propper, superintendent. Capitalization \$20,000,000. Claims to have lands in Utah, Montana, Colorado and Oregon. Is grossly over-capitalized, and probably moribund.

**CONSOLIDATED GOLD, COPPER
& COAL CO.**

WYOMING & COLORADO.

Mine office: care of W. C. Henry, Encampment, Carbon Co., Wyo. J. E. Hedding, president. Lands, 2 copper claims, area 40 acres, near Pearl, Larimer county, Colorado; 6 gold claims, area 98 acres, and 3,595 acres of coal lands 15 miles from Waldon, Larimer county, Colorado. Cannot be learned that any mining work is in progress.

CONSOLIDATED GOLD & COPPER MINING & MILLING CO. WYOMING.

Supposed to have lands near Encampment, Carbon Co., Wyo.

**CONSOLIDATED GREEN MOUNTAIN
ST. LOUIS MINES, LTD.**

BRITISH COLUMBIA.

Office: care of Chas. D. Clark, treasurer, Peoria, Ill. Mine office: Rossland, B. C. W. L. Lawry, president. Capitalization \$3,000,000, shares \$1 par. Has a 400' shaft. Idle.

CONSOLIDATED JEFFERSON GOLD & COPPER MINING CO. UTAH.

Organized June, 1902, under laws of Utah, with capitalization \$1,000,000.

**CONSOLIDATED KING DEVELOPMENT &
COLUMBIA COPPER MINING CO.**

ARIZONA.

Office and mines: Jerome, Yavapai Co., Ariz. Organized under laws of Arizona, with capitalization \$6,000,000, shares \$1 par. Geo. W. Hull, president; H. E. Wilcox, secretary. Lands, 34 claims, area 400 acres, in the Verde district, showing several ore bodies carrying oxide, carbonate and sulphide ores giving fair assay values in copper, gold and silver, opened by a 400' shaft and several tunnels, longest 1,200'. Has gasoline power and employed about 20 men at last accounts.

CONSOLIDATED LA SAL MINING & SMELTING CO.

COLORADO.

Office: North American Bldg., Philadelphia, Pa. Mine office: Cashin, Montrose Co., Colo. A reorganization of the La Sal Copper Mining Co., which produced 270,000 oz. silver and 224 tons refined copper, valued at \$212,286.69, after paying smelting charges, and from which dividends of \$24,000 were paid. James N. McBride, general manager. Lands, 10 claims, area 150 acres, opened by 1 shaft and 3 tunnels, having about 5,000' of underground openings on a 5' vein averaging about 8% copper and up to 134 oz. silver, with small gold values. Has steam and water power, leaching plant and small smelter. Property regarded as promising.

CONSOLIDATED MINING & SMELTING CO.

NEW MEXICO.

Mine office: Cerillos, Santa Fé Co., N. M. R. B. Thomas, manager; J. L. Wells, superintendent. Ores carry gold, silver, lead, copper and zinc. Company works the Tom Paine, Albany and other mines, extensively developed, well equipped with gasoline and electric power, and employing about 150 men. Has a 120-ton smelter and secures a little copper as a by-product.

CONSOLIDATED MINING & SMELTING CO.

UTAH.

Formerly at Brigham, Box Elder Co., Utah. Dead.

CONSOLIDATED NICKEL, TIN & COPPER MINES, LTD.

ENGLAND.

Offices: care of J. C. Ozanne, agent, 5 Court Row, Guernsey, Great

Britain. Organized, March 21, 1903, under laws of Guernsey, with capitalization £60,000, shares £1 par, to carry on copper mining in Cornwall and enter into an agreement with the Lerida Copper Mines, Ltd

CONSOLIDATED STANLEY MINING & MILLING CO. COLORADO.

Office: Jacksonville, Ills. Mine office: Idaho Springs, Clear Creek Co., Colo. John M. Jackson, superintendent. Ores carry gold, silver, lead and copper. Has steam and water power, with 10-stamp mill, and employs about 40 men.

CONSOLIDATED UNITED VERDE JUNIOR MINING CORPORATION. ARIZONA.

Office: Old Orchard, Me. Mine office, Jerome, Yavapai Co., Ariz. Jas. O. Bradbury, president and general manager. F. A. Sidelinger, secretary and treasurer. Claims said to show oxide and carbonate ores assaying 34% to 53% copper and \$6 to \$29 gold per ton.

COMPANIA MINERA LA CONSTANCIA. MEXICO.

Office: Saltillo, Mexico. Mine office: La Esmeralda, Coahuila, Mex. Daniel Sada, general manager. Operates the Juárez, Providencia, General Escobedo and other mines, producing ores of silver, lead and copper. Main shaft, 550', also a 2,000' tunnel. Has steam power and is a considerable producer, copper output, secured as a by-product, being small.

CONSTANTINE COPPER MINING CO. WYOMING.

Office: 76 East Third St., Winona, Minn. Mine office: Encampment, Carbon Co., Wyo. W. H. Elmer, president; John Tonsley, secretary; Earle R. Clemens, treasurer; P. J. Winters, superintendent. Organized November, 1903, under laws of Wyoming, with capitalization \$250,000, shares \$1 par, in 150,000 shares preference and 100,000 shares common stock. Lands, 3 claims, area 60 acres, unpatented. Country rocks are diorite and quartzite. Developments include a 22' shaft and 60' tunnel.

CONSTELLATION MINE. ARIZONA.

Mine office: care of Wm. F. Roberts, owner, Briggs, Yavapai Co., Ariz. Ores carry gold and copper values.

CONSTELLATION MINE. CALIFORNIA.

Mine office: Campo Seco, Calaveras Co., Cal. C. Berger, owner; E. J. Berger, superintendent. Has steam power.

CONSTELLATION GOLD MINES CO. OREGON.

Mine office: Sumpter, Baker Co., Ore. J. Higgins, superintendent. Ores carry gold, silver, lead and copper. Employs 10 to 15 men.

CONSTITUTION MINE. BRITISH COLUMBIA.

Mine office: New Alberni, Vancouver Island, B. C. Property is on Coos Creek, about 3 miles from New Alberni, and $\frac{1}{4}$ mile from tidewater, showing gold-copper ore in a 140' tunnel.

MINA CONSUELO. MEXICO.

Office: care of Dr. A. F. Gavilan, owner, Durango, Mex. Letter returned unclaimed from former mine office, Yurbaniz, Durango, Mex. Ores carry copper, silver, gold and lead.

CONSUMNES MINE. CALIFORNIA.

Now held by the Rio Vista Gold & Copper Mining Co.

CONTACT GROUP.**ARIZONA.**

Office: care of A. A. Patterson, Globe, Gila Co., Ariz. A group of 7 claims, near the Bobtail mine, about 15 miles from Globe.

CONTENTION MINING CO.**COLORADO.**

Mine office: Silverton, San Juan Co., Colo. G. E. Collins, manager. Ores carry gold, silver and copper values. Has steam and water power and employs 40 to 50 men.

CONTINENTAL ALTA MINES.**UTAH.**

Owned and operated by the Continental Mines & Smelting Corporation.

CONTINENTAL COPPER CO.**SOUTH DAKOTA.**

Office: Lima, Ohio. Mine office: Hill City, Pennington Co., S. D. Organized 1904, under laws of South Dakota, with capitalization \$3,000,000, shares \$1 par, to operate the properties of the Dakota Calumet Company and the Maloney-Blue Lead Copper Mining Co., through ownership of controlling stock interests in each. Saml. A. Baxter, president; Otto G. Tague, secretary; H. M. Moore, treasurer.

CONTINENTAL COPPER CO.**WYOMING.**

Office: Colorado Springs, Colo. Lands, in vicinity of Battle, Carbon county, Wyoming. John M. Harran, president; J. W. Wallwork, secretary.

CONTINENTAL COPPER MINING CO.**WYOMING.**

Mine office: Battle, Carbon Co., Wyo. J. T. Brown, superintendent, at last accounts. Property is in the Cow Creek district, and is said to show a large body of low-grade ore.

CONTINENTAL MINES & SMELTING CORPORATION.**UTAH.**

Offices: 90 Wall St., New York, and 409 Dooly Bldg., Salt Lake City, Utah. Mine office: Alta, Salt Lake Co., Utah. Employs 25 to 75 men, according to season. Henry M. Crowther, president; G. C. Van Alstyne, secretary and treasurer; W. G. Scott, superintendent. Organized July, 1903, under laws of New York, with capitalization \$5,000,000, shares \$10 par. Has paid 10% dividends on stock issued. Empire State Trust Company, 88 Wall St., New York, registrar. Lands, 18 claims, area 220 acres, also 20-acre millsite, in the Little Cottonwood district. Country rocks are limestone, porphyry, granite and quartzite, said to show about 20 contact veins of 1' to 40', between limestone and porphyry, giving assays of 2% to 35% copper, 10% to 48% lead, 7.5% zinc, 15 to 120 oz. silver and 60c to \$5 gold per ton, from malachite, azurite and oxide ores of copper, galena, sphalerite, etc., estimated to carry average values of about \$25 per ton. Has 5 shafts, deepest 200', and 9 tunnels, of 300' to 2,000', with total underground openings of 7,682'. A large body of 4% copper ore was cut in 1904. Mine was discovered 1864, opened 1870, closed 1892, reopened 1899. Has gasoline power. Production of metals to end of 1902 is estimated at \$1,000,000. Has a 5-mile aerial tram nearing completion, and a 100-ton concentrator just finished. Motive power is furnished by water from Little Cottonwood Creek, actuating a direct-connected Pelton wheel.

CONTINENTAL MINING CO.**WYOMING.**

Office: 20 Metropolitan Opera House Bldg., St. Paul, Minn. Mine office: Encampment, Carbon Co., Wyo. A. L. Cox, president; Ker D. Dunlop, secretary and treasurer. Organized 1898, under laws of Wyoming, with

capitalization \$800,000, shares \$1 par. Lands, 7 claims, area 120 acres, also 20-acre millsite, in the Battle Lake district. Is developing a 20' vein by 2 tunnels, longest 690'. Mine is served by the aerial tramway of the Penn-Wyoming company.

COONEY MINE.**NEW MEXICO.**

Owned and operated by Mogollon Gold & Copper Co.

COONEY HILL GOLD & COPPER MINING & MILLING CO. WYOMING.

Office: Cheyenne, Wyo. John Brown, secretary. Property supposed to be in the Encampment district of Carbon county, Wyoming.

CO-OPERATIVE MINING CO.**WASHINGTON.**

Letter returned unclaimed from former office, Berlin, King Co., Wash.

CO-OPERATIVE MINING & MILLING CO.**WYOMING.**

Mine office: Encampment, Carbon Co., Wyo. S. E. Phelps, secretary. Has a shaft on a fissure vein carrying iron oxides and traversing schists and quartzite.

COPAQUIRE COPPER SULPHATE CO., LTD.**CHILE.**

Offices: 101, Leadenhall St., London, E. C., England. Mine office: Copaquire, Tarapacá, Chile. Maj. L. Campbell-Johnston, chairman; J. E. G. Hadath, secretary; J. G. Green, mine manager; C. R. Enoch, engineer. Organized May 19, 1900, with capitalization £494,000; issued, £289,155. Property consists of 13 claims, known as the Huiniquitepa property, carrying deposits of chalcantinite; or natural bluestone, held under contract from the Chili Copper Sulphate Syndicate, claimed by company's experts to show upwards of 100,000,000 tons of ore valued at about £20,000,000. Development is by 150' shaft, open pits and trenches, amounting to about 1,000'.

Property has steam power and a lixiviation plant covering about 1 acre, rated at 500 tons daily capacity, with dehydrator for drying crystals of refined bluestone. Has electric light plant, necessary mine buildings and a number of stone dwellings, also a 4,000' tramway and various miscellaneous improvements, all walls and buildings being very massive to withstand earthquakes, which are of frequent occurrence in that vicinity. Company is short of cash, but long on faith in its properties.

EL COPETE COPPER MINES.**MEXICO.**

See Copete Mining Co.

COPETE & MELCZER MINING CO.**- MEXICO.**

Succeeded by Copete Mining Co.

COPETE MINING CO.**MEXICO.**

Office: 27 William St., New York. Mine office: El Copete, Sonora, Mex. Capitalization \$5,000,000, shares \$5 par. Walter S. Logan, president; Myra B. Martin, secretary; Chas. F. Spraker, superintendent. Prof. Geo. A. Treadwell claimed in 1900 to have found 10,000 tons of ore, averaging 10% copper and \$10 to \$60 gold per ton, on the dumps, ready for smelting, and "no trouble to get millions of tons of similar ore." If this be true, it is rather remarkable that the ore on the dumps has not been smelted. As a matter of fact, it is not at all probable that Prof. Treadwell found any such amount or value of ore. The property has a water system with four miles of pipe, and a large traction engine for transportation purposes. Has a small smelter, rated by company at 200 tons daily capacity, which is said to have produced upwards

of \$100,000 in a short run. Company has had some internal dissensions, but these are thought to have been settled. Company claims that the gold values will cover cost of mining and reduction, leaving the copper cost-free, which, of course, is not true. Prof. Robt. T. Hill, of the United States Geological Survey, a competent and conservative authority, who has examined this property states that the mine probably is valuable, but emphatically disclaims endorsing the company, which also is the verdict of the Copper Handbook.

COPIAPO MINING CO., LTD.

CHILE.

Offices: 16, Leadenhall St., London, E. C., Eng. Mine office: Copiapó, Atacama, Chilé. A. Holland, chairman; W. T. Holberton, mine manager; W. S. Bartlett, secretary. Incorporated June 21, 1836, with capitalization £250,000, shares £2 par. Company has been a considerable dividend payer, having disbursed 12s. 1898-1899; 7s. 4d. 1899-1900; 4s. 1900-1901, and 1s. 6d. 1902-1903. Property includes the Descubridora mine, in the Chico district, opened 1825, which is 2,700' deep, and is the company's principal producer, having raised 10,160 metric tons of ore, averaging about 16.5% copper in 1903. The Dulcinea mine, opened 1854, at Puquios, is a half mile in depth, and is a considerable producer. Other mines owned and operated include the Farellon, Candelaria, Carmen Alto, 225' deep, San Francisco, 325' deep, Antonia, Republicana and sundry mines in the Ojancos district. Average values of ore are very high, having ranged in the past 10 years from 18.13% copper in 1895, down to 13.40% in 1901, with 15.34% in 1903. Ore reserves were estimated in 1902 at 19,634 tons at 15%, and production for 1902 was 4,594,240 lbs. refined copper. Company also owns an estate 15 miles in length near Copiapó, and has an extensive lixiviation plant at Puquios. Company is one of the oldest operating in Chile, and is also the largest producer and one of the best managed among the Anglo-Chilean properties.

COPPER AGE MINING & SMELTING CO.

WYOMING.

Mine office: Battle, Carbon Co., Wyo. Lands, 12 claims, 2 miles north of Battle. Had a 150' shaft, with vein showing a 4' pay-streak carrying chalcocite. Probably idle.

COPPER BAR MINING CO.

NEW MEXICO.

Office: 135 Adams St., Chicago, Ill. Mine office: Organ, Donna Ana Co., N. M. Organized 1900, with capitalization \$1,000,000, shares \$1 par. E. Percy Warner, president; Henry Stephens, secretary and treasurer; C. N. Anthony, superintendent. Lands, 8 unpatented claims, area 150 acres, in the Organ Mountains, showing two lenses, said to be contacts, between limestone and porphyry, carrying chrysocolla and carbonate ores averaging 14% copper, with small gold and silver values, opened by shafts of 112', 132' and 177'.

COPPER BAR MINING CO.

WYOMING.

Mine office: Saratoga, Carbon Co., Wyo. W. J. Crane, president and general manager. Ore body has a 17' gossan capping, and is being opened by shaft, with steam power.

COPPER BASIN GOLD & COPPER MINING CO.

ARIZONA.

Office and mine: 42 Bank of Arizona Bldg., Prescott, Yavapai Co., Ariz.

Capitalization \$1,000,000, shares \$1 par. Alfred B. Noxon, president and secretary; W. W. Munds, superintendent. Lands, 17 claims. Has a 140' shaft, and has secured good assay values from auriferous and argentiferous copper ores. Has steam power and employs 10 to 15 men. Property considered promising.

COPPER BASIN MINING CO.**COLORADO.**

Mine office: Placerville, San Miguel Co., Colo. B. B. Harlan, president, Chicago, Ill.; Milton Evans, superintendent. Lands, 15 claims, opened by shaft. A carload of ore shipped to smelter returned 14% copper and \$2.50 gold per ton.

COPPER BELLE MINING CO.**ARIZONA.**

Mine office: Gleeson, Cochise Co., Ariz. Organized 1904, under laws of Arizona, with capitalization \$1,000,000, as a reconstruction of company of same name, bankrupt circa 1904. Peter Quinn, Henry J. Mayer, Eli Moneuse and Geo. E. Crawford of New York and Frank H. Hereford, of Tucson, directors, none of whom, except Crawford, were identified with former management. Wm. Kemp, manager. Lands, 8 claims, in the Turquoise district, showing considerable development and having a 50-ton smelter. Ore averages about 7% copper, with fair gold and silver values, and about 30 tons daily are supplied to the Old Dominion smelter at Globe. Employs 30 men. Property regarded as valuable.

COPPER BELL MINE.**WASHINGTON.**

Owned by Bunker Hill-Sullivan Copper Mining Co.

COPPER BELL MILL & MINING CO.**MONTANA.**

Office: Milwaukee, Wis. Mine office: Clinton, Missoula Co., Mont. W. D. Carrick, vice-president; W. K. Ketcham, superintendent. Organized 1900, under laws of Washington, with capitalization \$2,500,000, shares \$1 par. Lands, 10 claims. Main shaft 212', with tunnels of 200' on the Clinton vein and 560' on the Granite vein, showing ores carrying gold, silver, lead and copper. Has steam power.

COPPER BELT MINING CO.**MONTANA.**

Lands, a group of claims in the Wallace district, Missoula county, Mont.

COPPER BELT MINING CO.**UTAH.**

Office and mine: Marysvale, Piute Co., Utah. Organized March 29, 1901, under laws of Utah, with capitalization \$1,000,000, shares \$2 par. Saul Krotki, president; L. H. Bartholomew, president and general manager; Elnor Bartholomew, secretary. Lands, 45 unpatented claims, area 900 acres, also a 25-acre millsite, showing 4 fissure veins, claimed to have an average width of 8' and to give average assay values of 7% copper, 10% lead, 40 oz. silver and \$5 gold per ton from sulphide ores opened by 4 shafts, deepest 450', and tunnels of 125', 150' and 800'. Has steam power.

COPPER BELT MINING & MILLING CO.**WYOMING.**

Mine office: Rawlin, Carbon Co., Wyo. Lands, 35 claims, of which 12 adjoin the Ferris-Haggerty and Osceola mines of the Penn-Wyoming, 23 claims being in the Rawhide Buttes district, north of Guernsey.

COPPER BLOSSOM MINE.**WYOMING.**

A prospect near Encampment, Carbon Co., Wyo.

COPPER BULL MINING CO.**COLORADO.**

Offices: 306 Continental Bank Bldg., St. Louis, Mo., and L. B. 507, Pueblo, Colo. Mine office: Walsenburg, Huerfano Co., Colo. Organized 1901, under laws of Arizona, with capitalization \$3,000,000, shares \$1 par. Chas. R. Mason, president; Isaac M. Mason, secretary and treasurer; Chas. O. Unfug, general manager; H. S. McIntyre, superintendent. Lands, 32 claims, area 320 acres, showing five 7' fissure veins carrying oxide ores with claimed values of 10% copper, \$80 gold and 2 oz. silver per ton. Has shafts of 202' and 238', and a 464' tunnel. Management considered honest.

COPPER BULLION MINING CO.**ARIZONA.**

Office: 224 Byrne Bldg., Los Angeles, Cal. Mine office: Pearce, Cochise Co., Ariz. Organized 1900, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Ezra T. Stimson, president; Percy H. Clark, secretary; Chas. M. Renaud, superintendent. Lands, 30 claims, in the Turquoise district, showing 3 veins said to average 14' in width, assaying 9% copper, \$4 gold and 7 oz. silver per ton, from carbonate and sulphide ores. Has 4 shafts, deepest 210', and tunnels of 80' and 900'. Idle.

COPPER BUTTE MINES.**ARIZONA.**

Office: 1007 New York Life Bldg., Minneapolis, Minn. Mine office: Phoenix, Maricopa Co., Ariz. Organized July 21, 1900, under laws of Arizona, under name of Arizona Copper Mountain Mining Co., changed June, 1904, to present title. Capitalization \$6,000,000; shares \$10 par. Augustus C. Sheldon, president and general manager; Benj. C. Sheldon, secretary; Wm. E. Alber, treasurer; preceding officers, Geo. H. Abeel, Geo. W. Wallace and Wm. E. Ellis, directors; Allan G. Wilson, superintendent.

Lands, 35 unpatented claims, area nearly 700 acres, in the Mineral Creek district of Pinal county, Arizona, reaching to the Gila river, with a 160-acre smelter site, just west of the river and crossed by the Phoenix & Eastern Railway. Country rocks are granite, limestone, and cupriferous breccia, latter traced some 7,000' and of about a quarter mile width, opened by shafts of 80', 80', 120', 275', and 465', also by about 20 smaller shafts of 20' to 50' depth and 5 tunnels, longest 240' and 300'. Ores are oxides and carbonates at and near surface and sulphides at slight depth. Average assays of 39 samples give 7.39% copper, and ores carry up to \$3 per ton in gold and silver values. Has steam power and hoist good for 1,000' depth, with necessary mine buildings and 3 dwellings. Company plans to deepen the 2-compartment main shaft to 800' and drift therefrom about 2,000' in 1905, and at earliest possible date to build a 1¼ mile aerial tram and construct a 250-ton smelter. Company has some excellent men in its directorate and the property is one of vast possibilities, but it is entirely improbable that anything like the company's estimate of 8% average copper values can be secured under the test of actual production upon a considerable scale. Should the ores average half of 8% in copper tenor, the mine, because of the vast and almost inexhaustible extent of its ore body, has the potentiality of making an exceptionally large and profitable property.

COPPER BUTTE MINING CO.**SOUTH DAKOTA.**

Mine office: Custer, Custer Co., S. D. Harry Francis, superintendent.

COPPER BUTTES CONSOLIDATED MINING & SMELTING CO. CALIFORNIA.

Office: Los Angeles, Cal. Mine office: Bagdad, San Bernardino Co., Cal. Lands, sundry lead and copper claims, north of Bagdad.

COPPER CAÑON MINING CO. NEW MEXICO.

Mine office: Abiquiu, Rio Arriba Co., N. M., J. E. Irvine, superintendent. Property is 100 acres of undeveloped mineral lands.

COPPER CANYON MINE. BRITISH COLUMBIA.

Claims near the foot of Mt. Sicker, British Columbia. Opened by two tunnels, on a 4' vein, showing good ore. Idle.

COPPER CAVE MINING CO. WYOMING.

Office and mine: care of J. F. Crawford, Saratoga, Carbon Co., Wyo.

COPPER CENTER GROUP. MEXICO.

A group of claims near Moctezuma, Sonora, Mexico, on which some development work has been done by Dew R. Oliver, of San Francisco, Cal.

COPPER CENTURY GROUP. ARIZONA.

Mine office: Washington, Santa Cruz Co., Ariz. Geo. A. Lonsberry, superintendent. Ores carry copper, zinc, lead and silver. Has gasoline power.

COPPER CHIEF MINING CO. ARIZONA.

Mine office: Jerome, Yavapai Co., Ariz. Arthur Hendy, superintendent. Lands, about 5 miles south of Jerome, near the Iron King mine of the Equator company, show a large body of auriferous and argentiferous copper ore. Has steam power and a small leaching plant. Was formerly under option to Tharsis Sulphur & Copper Co., Ltd., and in 1904 a ridiculous and entirely unfounded story was spread that the property had been sold to the Calumet & Arizona interests for \$3,000,000. As a matter of fact the Calumet & Arizona directors who examined the property refused to buy it, and refused to recommend it.

COPPER CHIEF MINING CO. MONTANA.

Office: 604 Rookery Bldg., Spokane, Wash. Mine office: Dillon, Beaverhead Co., Mont. H. A. Fosselman, president; F. M. Longshore, secretary. Organized June, 1901, under laws of Washington, with capitalization \$375,000, shares 25c. par. Lands, 5 claims, area 100 acres, showing a 30' fissure vein in granite, opened by shafts of 45', 70', and 135' showing carbonates at surface with chalcoppyrite and a little chalcocite at depth, giving average assays of 12.5% copper, 2 oz. to 5 oz. silver and \$1.60 to \$9 gold per ton. Has steam power and necessary mine buildings, and plans erection of a concentrator and increase in forces.

COPPER CHIEF MINING CO. NEW MEXICO.

Property of company, in New Mexico, was forfeited to Jared Sater, who organized the Sater Copper Co., protecting shareholders of the Copper Chief by giving them new shares to the equivalent of their stock in the dead company.

COPPER CHIEF MINING CO. WASHINGTON.

Said to own 4 claims near Mineral City, Washington.

COPPER CLIFF MINES OF MONTANA, LTD. MONTANA.

Offices: 727-733, Salisbury House, London, E. C., Eng. Registered

September 11, 1903, with capitalization £2,000,000, for purpose of developing mines in Montana.

COPPER CLIFF MINING CO.**ARIZONA.**

Property sold to the Catalina Mining Co.

COPPER CLIFF MINING CO.**MONTANA.**

Office and mine: Cliff, Powell Co., Mont. W. P. Shipler, superintendent. Lands, 4 claims, area 80 acres, showing contact veins of good width, with oxide, carbonate and sulphide ores, said to assay 10% copper and \$10 gold per ton. Has tunnels of 300', 500' and 800', and a 200' shaft. Company plans building a smelter. Employs about 20 men.

COPPER CLIFF MINING CO.**SOUTH DAKOTA.**

Office: 79 Dearborn St., Chicago, Ill. Mine office; Rochford, Pennington Co., S. D. Organized 1899, under laws of South Dakota, with capitalization \$1,000,000, shares \$1 par. B. F. Brazee, president; Chas. A. Fohrman, vice-president and general manager; E. W. Eldridge, secretary. Property, carrying copper ore and graphite, is opened by 350' tunnel. Company is mining graphite and making paint therefrom in Chicago, and may give attention later to an 8' vein of low-grade copper ore on the company's lands.

COPPER COBRE MINING CO.**ARIZONA.**

Out of business. Lands now held by Bradshaw Mountain C. M. & S. Co.

COPPER COMPANY OF BRITISH COLUMBIA, LTD.**BRITISH COLUMBIA.**

Offices: 11, Grocers' Hall Ct., London, E. C., Eng. Was formed to acquire copper mines in the Kootenai district, British Columbia. Moribund.

COPPER CONTACT MINE.**NEVADA.**

Mine office: Sodaville, Esmerelda Co., Nev. Owned by A. F. Bettles, J. D. Thompson and W. R. Smith, of Salt Lake City, Utah. Apparently idle.

COPPER CORPORATION OF CHILE, LTD.**CHILE.**

In voluntary liquidation. J. Peters, St. George's House, Eastcheap, London, E. C., Eng., liquidator. Las Animas mines of this company have been sold to Las Animas Copper Mining & Smelting Co., Ltd., for £3,000 cash and £54,500 debentures.

COPPER CREEK CONSOLIDATED CO.**ARIZONA.**

Letter returned unclaimed from former office, Prescott, Yavapai Co., Ariz. R. H. Burmister, president; John Roberts, superintendent.

COPPER CREEK CONSOLS, LTD.**BRITISH COLUMBIA.**

Letter returned unclaimed from Ashcroft, B. C. Lands, on Criss Creek, and difficult of access, were claimed to show a vein of 3' to 4' width, assaying under 2% copper, and 17 oz. silver per ton.

COPPER CREEK MINING CO.**ARIZONA.**

Office: 1016 First National Bank Bldg., Chicago, Ills. Employs 4 men. Organized June, 1903, under laws of Arizona, with capitalization \$2,000,000, shares \$1 par; unissued, \$920,000. M. M. Atwood, president; Frank J. Sibley, secretary. Lands, 21 claims, area 420 acres, also 2 millsites, area 40 acres, in the Bunker Hill district, Galurio mountains, Graham county, Arizona, showing several fissure veins in rhyolite and contact veins between rhyolite and porphyry, of which 4 veins are opened by a number of pits and shafts of 10' to 230' depth, and 4 tunnels of 50' to 150' length. Ores opened so far are mainly cuprite and chalcocite, with small quantities of malachite

and chrysocolla, giving assays of 30% to 45% copper, 30 oz. to 100 oz. silver and \$1 to \$4 gold per ton. Management plans to deepen shaft No. 1 to 1,000', continue driving two tunnels and install a steam hoist.

COPPER CREEK MINING CO.

CALIFORNIA.

Letter returned unclaimed from Fresno, Fresno Co., Cal. Organized 1903, to develop sundry copper claims in the mountains east of Fresno.

COPPER CROWN OF ARIZONA MINING CO.

ARIZONA.

Office: 13 South Seventh St., Minneapolis, Minn. Mine office: Pearce, Cochise Co., Ariz. Organized 1900, under laws of Arizona, with capitalization \$2,000,000, shares \$1 par. Thos. W. Stevens, president; C. F. Potter, Jr., secretary; Chas. F. Potter, general manager. Lands, 17 claims, area 340 acres, also a 20-acre millsite and 10-acre smelter site, in the Dagoon Mountains, showing 3 veins giving assays of 5% to 40% copper, with small gold and silver values, from oxide, carbonate and sulphide ores. Has a 275' shaft and two short tunnels, with about 1,000' of underground openings. Owing to lack of funds, claims were leased Jan. 1, 1905.

COPPER CROWN MINING CO.

MICHIGAN.

Office: 616 North Broadway, St. Louis, Mo. Mine office: Matchwood, Ontonagon Co., Mich. Employs 8 to 10 men. Organized July 18, 1902, under laws of Michigan, with capitalization \$2,500,000, shares \$25 par. Dr. M. J. Hopkins, president; W. Wollaston Guest, general manager; W. R. Hopkins, secretary; J. F. Finnegan, superintendent. Lands, 1,320 acres, including the Hamilton group of 400 acres, this being composed of the Hamilton, Trap Rock, Essex and Windsor properties, and the Norwich and Lafayette mines, all old attempts at copper mines made in the early days of Lake Superior development. Openings are a 100' shaft on the Meads vein, said to show a little copper, and a tunnel of several hundred feet in length, showing nothing in particular. The company puts forth the following claims; "Five distinct veins of pure native copper ranging from 6' to 10' wide have been accurately located. These outcrop on the surface and can be easily traced and accurately located. * * * Experts say that beyond a doubt the Copper Crown possesses one of the richest ore bodies of virgin copper found in the Lake Superior district. That these native copper lodes extend for many miles into the earth is not a conjecture but an historical fact." Then follows an assay showing 75% metallic copper. Prospectus also says: "We court the fullest investigation. * * * Will gladly answer any questions and furnish any information that you may desire," notwithstanding which, the company has failed to furnish a report for the Copper Handbook, although repeatedly requested. The company also claims to have assets of \$50,000. The managers of the company are either incompetent or dishonest. First work was done on a drift boulder in sandstone, and a long tunnel is being driven to secure a "back" of about half the tunnel's length. The company is the laughing-stock of the Lake Superior copper district.

COPPER CROWN OF NOVA SCOTIA MINING CO.

NOVA SCOTIA.

Office: 373 Washington St., Boston, Mass. Organized under West Virginia laws, with capitalization \$1,000,000, shares \$1 par. Samuel K. Paige, president; Geo. B. Holden, secretary and treasurer; W. H. Kennan, manager. Lands, near Pictou, N. S., are claimed to show extensive ore bodies

averaging 5% to 6% copper. Has a smelter, with blast furnaces of 300 tons and reverberatory furnace of 70 tons daily capacity, located with tidewater in front and railroad tracks behind. Fuel and flux are abundant and cheap. Company is in litigation, with matters in chaotic and most unpromising condition.

COPPER DUKE MINE.**ARIZONA**

Owned and operated by Tip Top Copper Co.

COPPER DUKE MINE.**MONTANA.**

Partly developed claims, near Copperopolis, Meagher County, Montana.

COPPER EAGLE MINING CO.**OREGON.**

Mine office: Merlin, Josephine Co., Ore. R. J. Ginn, president; N. P. Hansen, secretary; J. C. Mattison, superintendent. Has a fairly wide quartz vein, giving assays of 10% to 30% copper, opened by a 300' tunnel and plans installing a 50-ton smelter. Employs 10 men.

COPPER ESTATES OF WESTERN AUSTRALIA, LTD.

Offices: 66, Finsbury Pavement, London, E. C., Eng. Location of property, if any, unknown.

COPPER EXPLORERS, LTD.

A moribund English corporation.

COPPER FALLS MINE.**MICHIGAN.**

Absorbed, 1898, by Arnold Mining Co. Fully described in Vol. I.

COPPERFIELD MINES.**VERMONT.**

Office: 820 Pennsylvania Ave., Pittsburg, Pa. Mine office: Copperfield, Orange Co., Vt. Geo. Westinghouse, Pittsburg, Pa., owner; Geo. J. Troop, Jr., general manager; Geo. C. Everett, mill superintendent; Wm. Ricker, mine superintendent. Property includes the old Ely and Copperfield mines, having a strong ore body carrying low-grade disseminated chalcopryrite. Main shaft, 3,700', on an incline of 23°, giving a vertical depth equal to about 1,500'. Has a 1,000' tunnel leading from 300' level to mill. Has a combined mill and smelter, connected with mine by a gravity tram, with two water-jacket blast furnaces and one reverberatory furnace and one stand of converters installed in 1902, making blister copper of 98% to 99% tenor. Property was worked on a considerable scale previous to circa 1860, and was reopened by present owner in 1900, and is again idle.

COPPERFIELD MINING CO.**UTAH.**

Letters returned unclaimed from former office, Bingham Canyon, Utah.

COPPER FIELDS OF NAMAQUALAND, LTD.**CAPE COLONY.**

Offices: 10, St. Helen's Place, London, E. C., Eng. A. Crump, chairman; N. A. Eustace, secretary. Lands, 354 acres, in Little Namaqualand, Cape Colony, South Africa.

COPPER GIANT GOLD & COPPER MINING CO.**WYOMING.**

Office: Encampment, Carbon Co., Wyo. D. Frank Powell, president; P. H. Kennedy, secretary. Idle.

COPPER GIANT MINING CO.

Office: Spokane, Wash. Wm. H. Ludden, president; L. B. Cornell, secretary. Organized 1897, under laws of Washington, with capitalization \$1,000,000, shares \$1 par. Company has 3 claims, with a fair showing of ore, but no money.

COPPER GLANCE CONSOLIDATED MINE.**UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. Is driving an 1,800' tunnel in McGuire gulch.

COPPER GLANCE MINING CO.**ARIZONA.**

Office and mine: Bisbee, Cochise Co., Ariz. S. W. Clawson, president and treasurer; A. S. Barker, secretary; C. L. Beckwith, general manager. Organized March, 1901, under laws of Arizona, with capitalization \$2,500,000, shares \$1 par. Annual meeting, March 9. Lands, 24 patented claims, area 480 acres, in the Warren district, about 9 miles southeast of Bisbee. Has shafts of 50', 100', 140' and 560' with tunnels of 75' and 150'. Idle. Fully described in Vol IV.

COPPER GLANCE MINING CO.**NEW MEXICO.**

Mine office: Taos, Taos Co., N. M. Idle at last accounts.

COPPER GLANCE MINING & MILLING CO. COLORADO & WYOMING.

Office: Sherwood Bldg., Elgin, Ills. Mine offices: Encampment, Carbon Co., Wyo., and Cashin, Montrose Co., Colo. H. N. Anderson, president; N. C. Westerfield, vice-president; C. A. Wetzel, secretary and treasurer; L. F. Judd, general manager. Property includes sundry copper claims in the Encampment district having a shallow shaft showing ore assaying 20% copper, and the La Sal mine, in Colorado, one mile from the Utah line, which has shipped considerable ore to smelters at Pueblo and Denver.

COPPER GLOBE MINING CO.**UTAH.**

Lands, sundry claims in the southwestern part of Emery county, Utah, said to show large bodies of low-grade copper ore. Title in dispute, at last accounts, between Dr. C. B. Snyder, of Provo, Utah, and Dr. W. R. Rice, of St. George, Utah.

COPPER-GOLD MINING CO.**WASHINGTON.**

Mine office: Bossburg, Stevens Co., Wash. S. G. Wilson, superintendent. Ores carry copper and silver.

COPPER-GOLD MINING & MILLING CO.**WYOMING.**

Mine office: Hecla, Laramie Co., Wyo. Joseph O. Majors, superintendent.

COPPER HILL MINE.**ALABAMA.**

An idle property, near Stone Hill, Cleburne Co., Ala. Once known as the Woods mine. Opened 1870, closed 1879. Had a smelter and worked as many as 500 men. Closed owing to exhaustion of high-grade ores. Vein is 24' wide, mineralized near walls to extent of 3% to 7% copper. Value of production secured was about \$1,300,000.

COPPER HILL MINE.**CALIFORNIA.**

Office: care of W. F. Detert, owner, Jackson, Cal. Mine is on the Consumnes river, in Amador Co., Cal. Was opened, circa 1861, and worked about 20 years, with considerable production. Vein formation, quartz porphyry, is 500' to 600' wide, with heavy gossan capping. Ore is chalcopryrite, associated with iron pyrites. At close of 1904, a new hoist was being installed, and plans were made to resume sinking.

COPPER HILL MINING CO.**ARIZONA.**

See Arizona Copper Hill Mining Co.

COPPER HILL MINING CO.**NEW MEXICO.**

Dead. Lands sold November, 1903, to A. B. Renahan, for \$7,600.

COPPER HILL MINING & MILLING CO.**WASHINGTON.**

Office: 504 Empire Bldg., Spokane, Wash. Organized 1899, with capitalization \$75,000, shares 5c par. F. J. Heller, president; G. O. Nettleton, secretary. Lands, 4 claims, area 80 acres, in the Newport district of Stevens county, Washington, with rail and water transportation easily accessible. Has a 230' shaft and a 260' tunnel, showing an 18' vein carrying chalcopyrite and pyrrhotite.

COPPER INDEPENDENT CONSOLIDATED MINING CO. WASHINGTON.

Office: 61 Court St., Boston, Mass. Mine office: Silverton, Snohomish Co., Wash. M. V. Little, president; E. P. Crooker, secretary; Arthur W. Hawks, general manager. Capitalization \$3,000,000, shares \$1 par. Also has a bond issue. Lands, 2 groups of claims, also several millsites. Has 5 tunnels, longest 1,200', with several thousand feet of underground development, on a fissure vein in granite. Plant includes a concentrator, 52x133', of wood, equipped with crushers, rolls and tables, said to be of 300 tons daily capacity. A turbine develops 550 horse power from the Stillaguamish river. Officers claimed to be men of good standing, and property said to be of considerable promise, but company began selling stock and paying 6% dividends simultaneously, which is plain evidence of poor management or worse. Companies so promoted usually end in the bankruptcy courts.

COPPER KING OF ARIZONA.**ARIZONA.**

Office: 116 Nassau St., New York. Mine office: Pearce, Cochise Co., Ariz., Elisha Boitel, president; Thos F. Gaynor, secretary and treasurer; Thos. F. O'Brien, superintendent. Is a reorganization of the Copper King of Arizona Mining Co., which was organized in 1895, with capitalization \$5,000,000, shares \$1 par, and peddled stock assiduously, the late B. C. Davis and his successor, Gaynor, both making large promises, none of which were redeemed. Operations were begun at Bisbee, transferred therefrom to Solomon Springs, thence to Barrett, and latterly at Pearce, all in Cochise county, Arizona. The new corporation, chartered 1903, under the laws of West Virginia by Messrs. Boitel, Hess and Brunton, took over the affairs of the Copper King of Arizona Mining Co. Management of the company was scandalously bad for many years, but seems to have improved slightly since Mr. Boitel's election to the presidency, but prospects not considered good.

COPPER KING OF ARIZONA MINING CO.**ARIZONA.**

Again reorganized; now Copper King of Arizona.

COPPER KING MINE.**ARIZONA.**

Mine office: Johnson, Cochise Co., Ariz. S. A. D. Upton, owner. A prospect having a limited amount of development work.

COPPER KING MINE.**ARIZONA.**

Office and mine: care of Peter Johnson, owner, Bisbee, Cochise Co., Ariz. This is the original property held by the Copper King of Arizona, but was abandoned several years ago, and relocated, 1903, by present owner. Has a 625' shaft, in porphyry, which has cut a number of small stringers of copper ore. Property was generally regarded as worthless, until recently, but developments on the Junction property indicate the possibility of considerable ore bodies underlying the porphyry, near its junction with the lime-

stone, in the Warren district. Material on dump, taken from shaft, is altered and slightly mineralized porphyry, carrying considerable iron pyrites.

COPPER KING CLAIMS.

BRITISH COLUMBIA.

Mine office: Kamloops, Yale & Cariboo district, B. C. Lands, sundry claims 16 miles west of Kamloops, showing ore giving assays of 5% to 20% copper, 1 oz. to 6 oz. silver and \$10 to \$20 gold per ton. Is working a small force, and made a carload shipment of slightly auriferous copper ore to the Crofton smelter in October, 1903.

COPPER KING GROUP.

BRITISH COLUMBIA.

Six claims near the Queen Victoria property, at Beasley, 7 miles west of Nelson, B. C. Shows several exposures of sulphide ore. Has gravel overburden, rich in float ore.

COPPER KING MINING CO.

BRITISH COLUMBIA.

Mine office: Cameron Lake, Nanaimo district, B. C. Has a 100' tunnel, showing copper ore.

COPPER KING, LTD.

CALIFORNIA.

An English company that had mining property at Letcher, Fresno Co., Cal., which became bankrupt through rottenly extravagant management, after squandering money of the confiding shareholders to the tune of upwards of £250,000. Fully described in Vol. III.

COPPER KING MINE.

COLORADO.

Held by Calumet Copper Co.

COPPER KING MINING CO.

COLORADO.

Succeeded by Pearl Copper Mining & Smelting Co.

COPPER KING CONSOLIDATED MINING CO.

COLORADO.

Incorporated April, 1903, by Milo A. Smith, et al, with capitalization \$300,000, to operate in Jefferson and Clark counties, Colorado.

COPPER KING MINING CO.

IDAHO.

Office and mine: Shoup, Lemhi Co., Idaho. Is a limited partnership. Lands, 11 claims, area 220 acres, also 260 acres miscellaneous lands, in the Mackinaw district, showing numerous fissure veins in quartzite, of which three, with average width of 10' to 12', are opened by 2 shallow shafts and 7 tunnels, of which 3 are 300' each in length, showing cuprite and malachite giving average assays of 7% copper, 1 oz. to 4 oz. silver and \$1 to \$3 gold per ton.

COPPER KING MINING & MILLING CO.,

IDAHO.

Office and mine: Mace, Idaho Co., Idaho. Organized March 22, 1902, under laws of Idaho, with capitalization \$1,250,000, shares \$1 par. P. P. Webber, president; Ed. Hearing, vice-president and treasurer; Chas. McKinnis, general manager; Joseph Rogers, superintendent; J. Le Brice, engineer. Lands, 7 claims, area 140 acres, also 10-acre millsite, well timbered, with available water power, in the Rapid River division of the Seven Devils district, showing 2 fissure veins in phonolite, of which one of 8' width is opened by a 265' tunnel, giving assays up to 40% copper, 300 oz. silver and \$20 gold per ton, from high grade argentiferous bornite, with a considerable amount of medium grade chalcopyrite. Is working a small force and plans shipping ore to the new plant of the Ladd Metals Co., at Landore.

COPPER KING MINING & SMELTING CO.**IDAHO.**

Supposed to have claims in the vicinity of Mullan, Shoshone Co., Idaho.

COPPER KING CLAIM.**MONTANA.**

Office and mine: care of Henry & Marshall Smith, owners, Parrot, Madison Co., Mont. Lands, one claim, 2 miles southeast of Parrot, giving ores assaying up to 12.5% copper, 0.85 oz. silver and \$2.80 gold per ton.

COPPER KING MINING CO.**MONTANA.**

Letter returned unclaimed from former mine office, Missoula, Mont.

COPPER KING MINE.**OREGON.**

Supposed to be located in vicinity of Comer, Grant Co., Oregon.

COPPER KING MINING CO.**OREGON.**

Letter returned unclaimed from former office, Pendleton, Ore. Incorporated, August, 1902, with capitalization \$1,500,000.

COPPER KING MINE.**SOUTH DAKOTA.**

Claims in the vicinity of Terry, Lawrence Co., S. D.

COPPER KING MINING CO.**UTAH.**

Dead. Lands sold to Consolidated Mining & Smelting Co.

COPPER KING MINE.**WASHINGTON.**

Mine office: Chewelah, Stevens Co., Wash. A prospect only.

COPPER KING MINING CO.**WASHINGTON.**

Mine office: Sumas, Whatcom Co., Wash. R. S. Lambert, supt.

COPPER KING MINING & MILLING CO.**WASHINGTON.**

Organized, 1898, under laws of Washington, with Geo. R. Trask, president, and Sam Hanauer, secretary. No trace of company's lands or present office found after protracted investigation.

COPPER KING MINING & MILLING CO.**WASHINGTON.**

Office and mine: Vancouver, Clark Co., Wash. Organized January, 1904, with capitalization \$1,000,000, shares \$1 par. by J. Connors, et al.

COPPER KING MINING SYNDICATE.**WASHINGTON.**

Office: Tacoma, Wash. R. E. McFarlane, president; E. Areith, secretary and treasurer; D. E. Guiley, superintendent. Capitalized at \$10,000,000. Lands, 64 claims, in Pierce county, Washington. Company has acquired the old Eastlick mine, said to have produced some very high-grade ore, and opened by a 130' crosscut tunnel, with a small amount of drifting. District said to be rich, but not easily accessible.

COPPER KING MINE.**WYOMING.**

Mine office: Tie Siding, Carbon Co., Wyo. W. C. Lynde, superintendent. Said to have been sold to Messrs. Martin & Lambert, of Chicago, for \$30,000.

COPPER KING MINING CO.**WYOMING.**

Letter returned unclaimed from former mine office, Rawlins, Wyo.

COPPER KING MINE.**YUKON.**

Mine office: Whitehorse, Yukon, Canada. Main shaft, 175'. Shipped 200 tons of high-grade ore to Ladysmith smelter in 1904. Property is promising but not easily accessible, and rail freights, between mine and smelter, are almost prohibitive.

COPPER KNOB MINING CO.**NORTH CAROLINA.**

Merged in Blue Ridge Copper Mining Co.

COPPER MINES OF TIBET, LTD.

Offices: 5-6, Great Winchester St., London, E. C., Eng. Capital, nominal, £100. Location of property, under the promoter's hat. A delicate example of British humour, of a certain kind.

COPPER MOUNTAIN DEVELOPMENT CO.**CALIFORNIA.**

J. B. Campbell, president; R. McCourt, superintendent. Lands, 50 claims, area about 1,000 acres, 35 miles east of Kaweah, Tulare Co., Cal. Ores are carbonates and sulphides, carrying 2% to 25% copper. Has a limited amount of development work.

COPPER MOUNTAIN MINING WASHINGTON & BRITISH COLUMBIA. & DEVELOPMENT CO.

Office: 5406 Union Ave., South Tacoma, Wash. Lands are in Washington and British Columbia. Capitalization \$200,000, shares 10c par. S. B. Cowles, president; Jos. Hutchinson, secretary; B. D. Holcomb, general manager; A. T. Macaulay, superintendent. The property at Ryan, Stevens Co., Wash., is idle. This has 4 claims, area 90 acres, with 3 ore bodies, one lens 75' wide being opened by a 300' shaft and 115' tunnel. The June group, at Quatsino Sound, B. C., includes 5 claims, area 258 acres, showing an ore body said to be 100' wide, with measured length of 3,000', giving assays of 6% to 8% copper, 3 oz. silver and \$2 gold per ton from chalcopyrite. A large amount of ore is shown in surface, and the deposit is worked open-cast. A shaft may be sunk later. Ore will be treated by the new smelter of the Yreka Copper Company, 7 miles distant. Property is considered promising, but was idle at last accounts.

COPPER MOUNTAIN MINING CO.**CALIFORNIA.**

Office: 310 Laughlin Bldg., Los Angeles, Cal. Mine office: Victor, San Bernardino Co., Cal. W. A. Cooper, president; J. S. Longley, secretary; J. A. Morlan, manager. Lands, 10 claims, including the Amazon mine, showing a 200' gossan outcrop, opened circa 1873, reopened 1901. Main shaft, 200', showing sulphide ores assaying 8% to 10% copper, with about 10,000 tons of ore on the dump.

COPPER MOUNTAIN MINING CO.**NEVADA.**

Mine office: Tacoma, Elko Co., Nev. D. Kane, superintendent. Has steam power. Probably idle.

COPPER MOUNTAIN MINING CO.**WYOMING.**

Office: care of Dr. C. W. Long, manager, Denver, Colo. Has claims on Copper Mountain, 20 miles southeast of Big Horn, Wyo., said to show a 6" vein of ore, assaying 40% copper, 517 oz. silver and \$15 gold per ton.

COPPER MOUNTAIN MINING & MILLING CO.**UTAH.**

Office: 323 D. F. Walker Bldg., Salt Lake City, Utah. Mine office: Milford, Beaver Co., Utah. Lafayette Holbrook, president; Benj. T. Lloyd secretary and manager. Capitalization \$80,000, shares, 10c par. Lands, 6 claims, having open-cuts and shallow shafts of 5' to 60', and a main shaft, of peculiar construction, about 250' in depth, showing an iron ore vein of 4' to 14' width, giving assays of 18% to 28% copper. Shaft is vertical for about 100'; thence drops 100' at an angle of 75°; thereafter has 50' sunk at an angle of 70°. If present plan of opening be continued, shaft eventually will emerge to surface. Has gasoline power. Was under \$125,000 bond and lease to

W. J. Bowring, et al, in 1904. Lessee secured considerable 5% ore from the property, which is regarded as valuable, if properly financed and developed.

COPPER MOUNTAIN MINING & SMELTING CO. MONTANA.

Mine office: Corbin, Jefferson Co., Mont. Organized 1904, with capitalization \$1,000,000. J. H. McCabe, manager. Lands, about 50 claims, area about 1,000 acres, on Copper Mountain, near Corbin. Development is by a 200' shaft, to be sunk 500' with first drifts opened on 500' level. Shaft has encountered numerous stringers of ore assaying 6% copper, with small silver values, but larger ore bodies of good grade are confidently anticipated at depth. Considerable diamond drill boring is being done also. Company is operating on a business-like basis and property is decidedly promising.

COPPEROPOLIS MINE. ARIZONA.

Office: care of Dr. J. M. Ford, Phoenix, Ariz. Mine office: Briggs, Yavapai Co., Ariz. Emery W. Fisher, superintendent. Ores carry copper, silver and lead. •Has gasoline power and employed about 20 men at last accounts.

COPPEROPOLIS MINE. MONTANA.

Owned by Daly Mining Co.

COPPEROPOLIS COPPER CO. OREGON.

Office: 503 McKay Bldg., Portland, Ore. Mine office: Comer, Grant Co., Ore. Organized 1900, under laws of Oregon, with capitalization \$120,000, shares 10c par. A. H. Willett, president; W. W. Gibbs, secretary, treasurer and general manager. Lands, 2 patented claims, area 40 acres, also 5-acre mill-site, showing 4 fissure veins with estimated average values of 12% copper, \$15 gold and 3 oz. silver per ton, from carbonate and sulphide ores. Has tunnels of 75' and 400', with steam, water and electric power, and contemplates installation of a leaching plant. Employs 15 to 20 men.

COPPEROSITY MINE. ARIZONA.

Mine office: Vekol, Pinal Co., Ariz. E. J. Bonsall, superintendent.

COPPER OXIDE GROUP. ARIZONA.

Mine office: care of W. H. Baker, P. O. Box 147, Bisbee, Cochise Co., Ariz. A group of 27 claims, located in Tombstone Canyon, about 6 miles northwest of Bisbee, on which assessment work has shown an iron outcrop

COPPER PLATE & ARIZONA MINING CO. ARIZONA.

A company by this title is said to have been organized just at close of 1904, by Duluth, Minn., parties, with capitalization \$5,000,000, to take over the Copper Plate group of claims on Chase Creek, near Clifton, Graham Co., Arizona.

COPPER PRINCE GROUP. ARIZONA.

A group of claims in the Eureka district of Yavapai county, Arizona.

COPPER PRINCE MINE. ARIZONA.

Mine office: Kingman, Mohave Co., Ariz. J. W. Smith, superintendent. Has gas power.

COPPER PRINCE MINING CO. CALIFORNIA.

Office: care of J. C. Ruddock, secretary, Ukiah, Cal. Mine office: Middleton, Lake Co., Cal. E. Lobree, president. Lands, 3 claims, opened by tunnel and trenches. A vein of 6' to 8' width, in limestone, gives assays of 5% copper, 1 oz. silver and \$3 gold per ton.

COPPER PRINCE CONSOLIDATED MINING CO.**UTAH.**

Mine office: Alta, Salt Lake Co., Utah. Organized 1904, with capitalization \$500,000, shares \$1 par. Anthony O. Jacobson, president; C. K. McCormick, vice-president; Chas. H. Post, secretary. Lands, 3 groups of claims, from which \$900,000 worth of ore has been shipped in the past. Lands are near the Continental-Alta and Columbus Consolidated.

COPPER QUEEN CONSOLIDATED MINING CO.**ARIZONA.**

Office: 99 John St., New York. Mine office: Bisbee, Cochise Co., Ariz. Employs about 2,500 men. Is fifth among the world's great copper producers, and destined to take a place very near the top within the next few years. Organized 1884, under laws of New York, with capitalization \$2,000,000, shares \$1 par. Is a close corporation, said to have but 14 shareholders. James Douglas, president; Geo. Notman, secretary and treasurer; Walter Douglas, general manager; S. W. French, assistant manager; S. W. Clawson, mine superintendent; Geo. B. Lee, smelter superintendent; W. F. Crane, chief auditor. Has upwards of 1,000 acres of mineral lands, the great value of much of the undeveloped territory having been established recently by operations of adjoining companies.

Mine was opened in 1880, on a solid outcrop of oxidized copper, iron and manganese, opposite the Copper Queen hotel in Bisbee. This entire ore body has been removed, leaving a large artificial cave. The original ore body gave average returns of 23% copper and was smelted in a 30" water-jacket furnace with English coke brought via San Francisco, but was exhausted in three or four years, and the mine had many ups and downs, until additional and far larger ore bodies were developed by following seams and stringers of ore wherever occurring, these almost invariably leading to further large and rich ore deposits. The formation of the Copper Queen and other mines of the district consists essentially of two dolomitic limestone beds of Carboniferous age, the upper white and the lower blue, dipping to the southward and flanking a granite-porphry core, with intrusive porphyritic horses. Until recently the principal ore bodies have been found at the base of the upper limestone bed, which is much broken and interrupted by feldspathic, igneous, intrusive rocks that evidently have a considerable bearing upon the ore deposits, which occur in pockets, lenses, chimneys, bunches, chutes, veins, stringers, seams—in fact in almost every manner possible, the larger bodies being connected in most cases by small veins or mere knifeblade seams. The limestone and its included ore bodies have a general pitch to the southeast, somewhat sharper than the pitch of Tombstone Canyon, necessitating deeper and deeper shafts as distance is made toward the southeast. In 1902 extensive bodies of high-grade ore were found in the underlying limestone strata, and developments at the Calumet & Arizona mine proved these underlying ore bodies to be persistent to great depth. All of the Copper Queen's deep shafts are bottomed in disseminated sulphide ores of high grade, consequently the depth of the ore bodies, while already proven to be great, is conjectural. The mines show numerous beautiful caves lined with calcite, some of these being of considerable size and frequently found in close association with good ore bodies. The alteration zone is variable and erratic, as rich oxidized ores have been found on the lowest level, with chalcocite and bornite occurring

above azurite, malachite, cuprite and even considerable bodies of native copper. The larger masses of native metal, ranging up to several hundred-weights and even tons in weight, have been found mainly, not in the upper levels, as might have been expected, but at considerable depth. There is much talc and hematite, with frequent occurrences of manganese, in connection with ore bodies. Only oxidized ores were worked until about 1893, when converters were added to the smelting plant, since which time the furnaces are charged with mixtures of oxide, carbonate and sulphide ores, perhaps one-third of the charges being sulphide ores, the ores smelted giving average returns of better than 7%. The system of assaying used by the mine gives no figures regarding ores richer than 15% and the frequent occurrence of the figures "15+" on the assay books of every shaft testifies to the wonderful richness of the ore bodies.

The various shafts of the mine range from 400' to 1,200' in depth, and the mine has nearly 150 miles of underground openings. There are three producing shafts, these being the Czar, Holbrook and Spray, with three developing shafts, the Lowell, Gardner and Sacramento, and one shaft, the White Tail Deer, under lease, also a number of old and small exploratory shafts and pits. The mine is opened ahead for perhaps eight or ten years, and since 1902 the bulk of the ore smelted has come from development work only, the present ore reserves of this property being among the richest and most extensive ever developed. The ores are so soft that securing the mine openings is a serious problem, as the entire hill above the mine is creeping, and serious crushes can be avoided only by heavy timbering and the exercise of great care. Many of the lower stopes are bulkheaded throughout. The mine is timbered with square sets of 10x10" and 12x12" timber, mainly Washington fir, and an average of 30' of timber, board measure, is required for each ton of ore won. All ore is hand-sorted underground after breaking, and culls used for filling in worked-out stopes, this material standing remarkably well. That the Copper Queen mine, operated under these numerous disadvantages and menaces to life, is one of the safest copper mines in existence for underground workmen, is proof of the experience and ability of its management.

The Czar shaft is the oldest of the present workings and the old smelter and principal shops are found clustered about this shaft, on a narrow bench of ground made by grading the steep hillside. This shaft is connected underground with the Holbrook, Spray and Gardner shafts, and ultimately all six shafts will have numerous connections. The old plant was crowded and apparently inadequate, notwithstanding which it earned many millions for the Copper Queen company in the past, doing much better work than its appearance promised.

Next southeast of the Czar is the Holbrook shaft, an old and reliable producer carrying very rich ores, and excessively hot in the lower levels. Enormous new ore bodies have been discovered and opened, 1903-1904, in this shaft, which is now the principal producer of the mine. The shaft is 500' deep, with a 100' winze from the bottom level, and was cut down in 1904 from 4 compartments to 6-compartment size, and is being equipped with a new steel gallows-frame, 750-h. p. hoist and a new battery of boilers.

Next southeast is the Silver Spray, commonly known as the Spray, the newest of the mine's producing shafts. This is 950' deep and has three compartments, two carrying 3-deck cages for ore cars, with a man-way and pipes in the third compartment. The pump station is on the 700' level. This shaft shows rich ores from the fourth level to the bottom, the upper workings carrying mainly chalcocite, which changes to bornite on the fifth level, with carbonates, oxides and a continuance of sulphide ores shown on the sixth level, both oxidized and sulphide ores occurring on the seventh, and with mainly sulphide ores on the eighth level. The ore bodies are very extensive and persistent, but most erratic in nature, with frequent occurrence of porphyry dykes. A considerable body of native copper was cut on the 700' and again on the 800' level, thus setting at defiance some deeply cherished geological theories regarding ore deposition. The Spray has underground connection with the Gardner and from the richness and great extent of its ore bodies must become a very heavy producer. This shaft is not far from the Irish Mag shaft of the Calumet & Arizona.

The Lowell is a property bought in 1901, and the shaft is southeast of the Irish Mag shaft of the Calumet & Arizona. The depth is 1,120', and underground connection has been secured with the Gardner shaft. No important ore bodies have been opened above the 900' level, but very large lenses have been developed on both the 1,000' and 1,100' levels, ore being high-grade sulphides. This shaft makes about 175,000 gallons of water daily, forked by a Prescott pump from a station on the 1,000' level. On surface an excellent plant has been installed, and 3,000-ton ore bins built. The Lowell became a producer in 1904, and has shipped carloads of ore averaging 55% copper, the average being much lower, of course, but remarkably high.

The Gardner shaft, near the porphyry contact, is an old and shallow shaft, cut down, 1903, to 3-compartment size, by upraising. The shaft is now 1,100' in depth, and will be sunk to at least 1,200'. Immense bodies of high-grade sulphide ores, much like those of the Lowell, are being developed. The Gardner has a 100' steel gallows-frame, is installing a 750-h. p. hoist similar to that at the Holbrook, and should become a producer reasonably early in 1905.

The Sacramento is a new shaft, started 1904, and was about 400' deep at the close of the year. This is a 3-compartment shaft, with hoisting compartments 4'x6'2" in size, and a 5x8' compartment for pump columns, air pipes, wires and ladderway. The location is on Sacramento Hill, the key-stone of the Bisbee copper deposits, and underground connection will be made with the Lowell as soon as sufficient depth is gained.

The White Tail Deer shaft is some distance south of the company's main workings, and reached by road only by a detour of several miles. This was opened, circa 1893, by an incline shaft of 100', and a drift was sent to the line of the Broken Promise claim, now owned by the Wolverine & Arizona, the drift showing good ore, the product being hauled to the smelter by a traction engine. The White Tail Deer was leased, 1903, to Birdno Bros. & Boggs, and the lessees have reopened the old incline and are following a vein of high-grade ore, while the property also shows a big body of low-grade ore.

Small shipments made by the lessees, in 1904, ranged 12% to 50% in copper tenor.

The Copper Queen has 32 boilers at the mine and smelter, fuel being principally Texas and California petroleum, consumption amounting to about 13,000 gallons daily. Petroleum has proven cheaper in initial cost and cleaner and easier for handling than coal, in addition to which a large saving is effected in the number of stokers required. The principal shafts have connection, by spur tracks, with the El Paso & Southwestern Railway, also controlled by Phelps, Dodge & Co., and all ore is shipped in steel hopper cars to Douglas, the old smelter at the Czar shaft having been dismantled 1904. Doubtless the two monstrous old slag dumps at Bisbee will be broken up and resmelted in time, as they carry considerable copper values that can be partially extracted at a profit under the more advanced and economical metallurgical conditions of the present day.

The Douglas Reduction Works are 28 miles from the mine and within a mile of the Mexican border. This magnificent new plant was designed as the central smelter for the mines of Phelps, Dodge & Co., in Arizona and Mexico, these including the Copper Queen at Bisbee, the Detroit at Morenci, the United Globe and Old Dominion at Globe, the Moctezuma at Nacosari, Sonora, and the Sierra de Cobre at La Cananea, Sonora, Mexico. As these six properties produce a great diversity of copper ores, including those of practically every grade and character found in the southwest and in northern Mexico, it will be possible by means of this central reduction plant to take the fullest advantage of the varied nature of the ores to mix the furnace charges. This plant also treats custom ores of copper, gold and silver, and the company plans to enrich its copper bullion with gold and silver, mainly from Mexican ores, but does not intend to invade the lead market.

The new smelting plant at Douglas is entirely of steel, the principal buildings having the following dimensions: furnace building, 150x396'; power house, 110-250'; machine shop, 80x204'; boiler house, 45x208'; boiler shop, 80x120', and foundry, 60x80'. The smelter has 5 furnaces, each 42x204" with capacity of about 400 tons daily, giving the plant a nominal daily capacity of 2,000 tons, in addition to which three 42x120" furnaces from the old smelter at Bisbee are being installed in the western end of the new plant. Each furnace has a separate settler and separate Connorsville blower for blast. A standard gauge railroad with dump-cars cares for the slag. The dust-chamber is of brick. Molten matte is taken from furnaces to converters by two 60-ton electric traveling cranes, each having two 15-ton auxiliary hoists. There are four stands of converters, with monstrous shells of the Copper Queen horizontal barrel type, each 8'x11'6". Blast for the converters is furnished by 4 air compressors, one for each stand, these being cross-compound, duplex condensing Nordberg compressors with 30" cylinders and 42" stroke. The converter department is supplied with a silica mill and briquetting plant, and at the close of 1904 a 72' steel addition was being built, and present equipment and capacity will be doubled.

The boiler house has six 500-h. p. Stirling water-tube boilers, and a Green fuel economizer, with a brick stack 177' high and 13' in diameter, surmounted by 4 lightning rods. The boilers are arranged to burn either coal

or petroleum, but the latter is used almost exclusively. The power plant is supplied with 13 engines of various sizes, types and uses, having an aggregate of 4,000 h. p. The electric plant has four 250-volt 400-kw. direct-current electric generators, supplying power for the traveling cranes, motors, slag-locomotives and electric lighting. The machine shop is fully equipped with modern tools and the boiler shop is designed to turn out work of the heaviest nature, and, if necessary, can repair locomotives. The smithy in connection with the boiler shop is also supplied with the best in equipment.

Adjoining the furnace building is a steel trestle 48' in height and 1,343' long, divided into sections with bins for coke, fluxes and silica. Near this trestle are three ore pits, each 12' deep, 38' wide and 765' long, lined with white tufa from a nearby quarry, with railroad tracks alongside, and having 10,000 tons capacity each. Ore is dumped into these pits from trains and removed as needed by a steam shovel. Much delay was experienced in constructing the new works through delay in delivering material, and the furnaces were not blown in until 1904. Everything about the plant is working satisfactorily, except the mechanical mixing beds, which still give some trouble, owing to defects in the dumping device, but this is a comparatively small matter, and will be remedied soon. The new plant was designed upon a scale deemed sufficient to provide fully for all possible growth for at least 10 years to come, but the growth of the mines was such that the new works were crowded with ore from the first day. It was planned to operate but 4 of the 5 furnaces, holding one in reserve for repairs, etc., but it has been found necessary to keep all 5 in continuous blast. The addition of the 3 furnaces from the old Bisbee plant will give some relief, but the tremendous growth of the Phelps-Dodge properties, notably the Queen, and their even greater possibilities for the future, render it probable that even this great plant, now the second largest copper smelter in the United States, will prove inadequate, and will require further additions in the near future.

The El Paso & Southwestern railroad, owned by Phelps, Dodge & Co., which serves the Copper Queen mine and smelter, has some 300 miles of main line, with considerable trackage in spurs and sidings, and while designed solely as an outlet for the Phelps-Dodge mines, has developed a previously inaccessible district, rich in natural resources, and its business has increased in a manner astonishing to even the most optimistic. One result of the construction of this line is the building of the new town of Douglas, named in deserved honor of Prof. James Douglas, a bustling young metropolis of some 7,000 souls, apparently destined to become a strong competitor of El Paso as a smelting point for the ores of Arizona, New Mexico, Sonora and Chihuahua.

Among the miscellaneous enterprises of the Copper Queen are a sawmill in the Chiricahua mountains and an enormous department store, carrying a stock and doing a business that would do credit to any city of ten times the population of Bisbee. There is, however, no compulsion of employees, who are at perfect liberty to buy their goods at any of the numerous independent mercantile establishments. The company maintains a large and well equipped hospital, a fine four-story hotel, large library and reading

room, and a very handsome three-story gymnasium, supplied with baths, bowling alleys and a large auditorium in which scientific and popular lectures are given frequently.

The relations of the Copper Queen with its workmen are notably cordial, and a credit to both employer and employe. Wages of underground workmen are \$3.50 per day for 8-hour shifts, and these wages and hours were established many years before the first miner's union was heard of in the southwest. Strikes or serious dissensions of any sort between capital and labor are almost unknown in the Bisbee district.

Production in 1904 was 58,605,000 lbs. refined copper, and this should be increased in 1905. The Queen should become a sharp competitor of the other five great mines of the world for first rank as a producer, within the next three years, having almost unlimited ore reserves.

In its public spirit and practical philanthropy, the Copper Queen bears considerable resemblance to the Calumet & Hecla. The exceptionally broad and tolerant spirit of its management is shown, not only in the treatment accorded its employes, but also in its cordial relations with the new mines in Bisbee, which it has aided in many ways, notably by giving low freight rates, without which the new mines would have been throttled in their early youth. The public spirit of the company is shown by liberal donations to all local enterprises, and the fostering of everything calculated to promote the mental, moral and material welfare of the town of 10,000 people that has been built up about its mines. As a mine, a profit-earner, or a business enterprise conducted along the broadest and soundest of lines, the Copper Queen Consolidated Mining Company scarcely could be improved upon in any direction.

COPPER QUEEN MINING CO. OF ALASKA.

ALASKA.

Neither office nor lands located

COPPER QUEEN CLAIMS.

ARIZONA.

Mine office: Stoddard, Yavapai Co., Ariz. Have ore carrying copper and gold values, opened by tunnel

COPPER QUEEN GROUP.

ARIZONA.

Mine office: Riverside, Pinal Co., Ariz. A group of rather promising claims, near the Ray. Idle.

COPPER QUEEN, LTD.

BRITISH COLUMBIA.

Offices; 17, Basinghall St., London, E. C., Eng. A. G. Smith, chairman; F. G. Walter, secretary. Capital, nominal, £10,000; issued £1,403. Abandoned its original property, the Copper Queen Group, at Nelson, B. C., and invested resources in 1,200 shares of the Bosua Mines, Ltd.

COPPER QUEEN MINE.

BRITISH COLUMBIA.

This property, on Texada Island, B. C., is owned and operated by the Tacoma Steel Co.

COPPER QUEEN MINE.

CALIFORNIA.

B. F. Rogers, superintendent at last accounts. Is in the Pit River district of Shasta county, California, and is opened by a 350' tunnel.

COPPER QUEEN GROUP MINING CO.

COLORADO.

Office not found. Capitalization \$1,000,000, shares \$1 par. Lands, 7 claims, in the Elk Mountain district of Gunnison county, Colorado. Locally regarded as promising, but idle at last accounts.

COPPER QUEEN MINE.**COLORADO.**

Lands, 160 acres, on Sultan Mountain, San Juan county, Colo. Has a 70' tunnel following the contact, showing ore assaying 15% copper and \$25 gold per ton, with small silver values.

COPPER QUEEN GROUP.**IDAHO.**

Lands, 12 claims, in the Blackbird district of Lemhi county, Idaho, said to show an 8' vein assaying 27% copper and \$8 gold per ton.

COPPER QUEEN MINE.**IDAHO**

Office: care of T. E. G. Lynch, Digby, N. S. Is worked under lease by Poindexter Bros. & Ham, of Dillon, Mont. Property is in Lemhi county, Idaho, near the Montana line. Has shipped a number of carloads of ore, some running as high as 28.7% copper, 5.5 oz. silver and 0.8 oz. gold per ton, one car of 21 tons returning 19% copper, 4.5 oz. silver and 1.34 oz. gold. The Bluebird, an adjoining claim held by same owner, has shipped ore giving smelter returns as high as 27.4% copper, 32.7 oz. silver and 0.8 oz. gold. Property is regarded as promising.

COPPER QUEEN MINE.**MONTANA.**

Mine office: Bullion, Mont. Said to be under a two-year bond and lease for \$100,000 to W. C. Bennett and C. S. Ballard, of Springfield, Mass.

COPPER QUEEN MINING CO., LTD.**ONTARIO.**

Office: Sault Ste Marie, Mich. Organized 1902, under laws of Ontario, with capitalization \$3,000,000, shares \$10 par. W. L. Murdock, president; R. G. Ferguson, vice-president; R. N. Adams, secretary and treasurer; David Brown, general manager. Lands, 960 acres, in Morin Twp., Algoma, Ontario, 25 miles north of Bruce Station, on the C. P. R., showing a 45' fissure vein traceable 3 miles, carrying mainly medium-grade chalcopryrite, more or less auriferous, with occasional bornite and melaconite, giving assays of 5% to 25% copper. Lands are heavily timbered and well watered. No. 1 shaft, nearly vertical, is 138' deep; No. 3, is a shallow 2-compartment shaft, 2,000' north of No. 1, and there are 2 tunnels, longest 195'. Property sold under mortgage, 1904, to Joseph Hermann, Lorenz Caesar and others, of Calumet, Mich. Efforts being made to raise funds to redeem the property.

COPPER QUEEN CLAIMS.**SOUTH DAKOTA.**

A prospect near Custer Peak, S. D., with an 80' shaft showing fair grade ore.

COPPER QUEEN CONSOLIDATED MINING & MILLING CO.

Office: 500 Auerbach Bldg., Salt Lake City, Utah. No returns secured in response to repeated requests, and location of property, if any, not learned.

COPPER QUEEN MINING CO.

Office: 542 The Rookery, Spokane Wash. No returns secured in response to repeated requests for information, and location of property, if any, unknown.

COPPER QUEEN CONSOLIDATED MINING CO.**WYOMING.**

Letter returned unclaimed from former mine office, Dillon, Wyoming.

COPPER RANCH MINING CO.**UTAH.**

Office: 323 D. F. Walker Bldg., Salt Lake City, Utah. Mine office: Milford, Beaver Co., Utah. Organized under laws of Utah, with capitalization \$500,000, shares 50 cents par. Moses Thatcher, president; C. L.

Rood, vice-president; Benj. T. Lloyd, secretary and treasurer. Company has no bonded or other indebtedness. Lands, 17 claims, area 340 acres, lying between the Old Hickory and O. K. mines of the Majestic company, and carrying about 2 miles of outcrop along the strike of the vein, which apparently is about 100' wide, and has been developed, at intervals, for a distance of about 1 mile. Assays have ranged from 7% to 43% copper, 7 to 10 oz. silver and \$2.25 to \$8 gold per ton. It is estimated that the entire vein will average 4% to 7% copper, with fair gold and silver values. Idle, but for annual assessment work, and lacks funds for development. Property regarded as valuable, if properly financed and managed.

COPPER RANCH GOLD MINING & MILLING CO.

Office: 1711 Tremont St., Denver, Colo. Wm. Rogers, general manager. Capitalization \$1,000,000, shares \$1 par. Lands, 170 acres, patented. Shaft, 218', with 350' of drifting.

COPPER RANGE CO.

MICHIGAN.

Office: 27 State St., Boston, Mass. Mine office: Painesdale, Houghton Co., Mich. Wm. A. Paine, president; Frederick Stanwood, secretary and treasurer; Lucius L. Hubbard, general manager. All of the stock issue, except founders' shares, is owned by the Copper Range Consolidated Co., which see, for further details.

COPPER RANGE CONSOLIDATED CO.

MICHIGAN.

Office: 27 State St., Boston, Mass. Local office: Houghton, Houghton Co., Mich. Organized November, 1901, under laws of New Jersey, with capitalization \$28,500,000, increased in 1903 to \$38,500,000, in 385,000 shares, par value \$100. Has about 1,500 shareholders. Wm. A. Paine, president; Frederic Stanwood, secretary and treasurer; Cameron Currie, R. T. McKeever, Frederic Stanwood, W. A. Paine, John Stanton, Samuel L. Smith, J. Henry Brooks, Chas. H. Paine and Kenneth McLaren, directors; John M. Wagner, purchasing agent. The Copper Range Consolidated Co. is a securities holding corporation, controlling stock interests in sundry subsidiary corporations. It controls practically the entire stock issues of the Baltic Mining Co., Copper Range Co. and Copper Range R. R. Co., and about 99% of the stock issue of the Trimountain Mining Co., with one-half the stock of the Champion Copper Co. and a large share interest in the Michigan Smelting Co. The Baltic, Trimountain and Champion mines, and the Michigan Smelting Co. are described elsewhere, under their respective titles.

The company's balance sheet of Jan. 1, 1904, showed holdings of 99,674 shares of the Copper Range Co., 99,659 shares of the Baltic Mining Co., 99,532 shares of Trimountain Mining Co., and 829 shares of unissued stock of the Copper Range Consolidated Co., latter being held subject to exchange for the 341 shares of Baltic and 468 shares of Trimountain not already owned by the Copper Range Consolidated Co. The balance sheet also showed an item of \$708,561.66 due from Trimountain majority shareholders, this being to cover the floating debt of the Trimountain, assumed by the Copper Range when the Trimountain was absorbed in 1903. The Copper Range Consolidated Co. also owns \$1,281,800 of the capital stock of the Copper Range Railroad Co.

The holdings of the Copper Range Co., include 9,360 acres of land on

the mineral belt, south of the Baltic, from which tract one-half of the lands composing the Champion mine were set off, the other half being supplied by St. Mary's Mineral Land Co., the stock of the Champion Copper Co. being divided equally between the parent corporations. The Copper Range lands comprise a compact tract in Town 54 North, Range 34 West and Town 54 North, Range 35 West, something more than 5,000 acres being located on the mineral belt. The company also holds an option on 2,000 acres of mineral land owned by St. Mary's Canal Mineral Land Co., in the immediate neighborhood of its own holdings. Miscellaneous lands include 441 acres with nearly 4 miles frontage on Lake Superior, near the mouth of the Graveraet river, 3 miles southwest of the Champion mill at Freda, sufficient to give sites to three or four new stamp mills.

The Copper Range Railroad Co., organized 1899, under laws of Michigan, has an authorized capital of \$5,000,000, shares \$100 par; issued, \$3,886,900, of which the Copper Range Co., holds \$2,605,100, and the Copper Range Consolidated Co. holds \$1,281,800. The Copper Range Railroad Co. has an authorized bond issue of \$20,000 per mile of completed main line and \$15,000 per mile of completed branch lines and side tracks, and had \$2,025,000 of first-mortgage 5% bonds outstanding on Jan. 1, 1904. Officers of the Copper Range Railroad Co. are Wm. A. Paine, president; Jas. H. Seager, vice-president; Frederic Stanwood, secretary and treasurer; R. Townsend McKeever, assistant secretary and general manager; preceding officers, John H. Rice, Frank McM. Stanton, Rufus R. Goodell, Samuel L. Smith and Cameron Currie, directors.

For the 6 months ending Dec. 31, 1903, the net earnings of the railroad company were \$279,810.05, of which \$208,765.86 was from freight, \$55,640.52 from passenger traffic and \$15,403.67 from miscellaneous sources. Total operating expenses were \$159,946.57 and taxes and interest \$42,958.41, leaving a net surplus of \$76,905.07 for the 6 months, or at the rate of a trifle better than 4% yearly on the outstanding capital stock.

The Copper Range railroad runs 56 miles from Calumet to Mass City, Ontonagon county, Michigan. Producing mines on the line between Houghton and Mass City are the Atlantic, Baltic, Trimountain, Champion and Adventure, in addition to which the Winona mine is developing and there are a number of companies operating prospects. Connections are made with the D. S. S. & A. and the Mineral Range railroads at Houghton, and with the Chicago, Milwaukee & St. Paul railway at Mass City. The bulk of the railroad's business is rock transportation between the mines and mills served by the line, but the timber and fuel traffic is heavy and steadily increasing, while passenger traffic and general freight business have shown steady and surprisingly heavy growth. The district traversed by this railroad, settlement of which was made possible by the construction of the line, was practically a wilderness in 1899, but now has a population of 20,000 souls and produced upwards of 40,000,000 lbs. of copper in 1904. The railroad owns a half interest in a railroad bridge crossing Portage Lake and has valuable and extensive water frontage on Portage Lake, in the western part of Houghton, partly improved with large and well-built merchandise and coal wharves, substantial freight depots and a two-story stone and brick general

office building. The coal wharf is supplied with the most modern hoists and devices for the economical and expeditious handling of bituminous coal. The roadbed of this line, which was very rough originally, has been improved year by year, until it now compares favorably with many of the leading trunk lines. Locomotives and rolling stock have been added, and the railroad has enjoyed a steady and symmetrical growth. The district tributary to this line is rich, not only in copper, but also in arable soil and standing timber, mainly hemlock and hardwoods, while a number of important towns are growing up about the leading mines.

Through its subsidiary mining corporations the Copper Range Consolidated Co. is now the second largest producer of copper in the Lake Superior district, and in 1904 made from the Baltic and Trimountain mines and its half ownership of the Champion mine, nearly 30,000,000 lbs. of copper, produced at a cost of less than 9c per pound. Net earnings for the year, after deducting heavy construction expenses, were upwards of \$1,000,000. While the capitalization of the Copper Range Consolidated Co. is large, the holdings are very extensive and the value of its mining interests is second only to the Calumet & Hecla in the Lake Superior field. The company has immensely valuable properties, which will require some years to reach their full growth, and justice to these properties and the future interests of the shareholders have required and will require heavy outlays for permanent improvements. While the management has been criticised in certain quarters for not declaring dividends, the wisdom of following exactly the plan adhered to is not open to question. The dividends will come a little later and will be all the larger and steadier because not declared out of money that better could be used on the property.

COPPER RANGE & ARIZONA MINING CO.

ARIZONA.

Office: Old South Bldg., Boston, Mass. Mine office, Tucson, Pima Co., Ariz. Employs 15 to 20 men. Organized under laws of Arizona, with capitalization \$1,000,000, shares \$2 par. Francis M. Hartman, manager. Lands, 15 claims, area 300 acres, also 20 acres carrying water-rights. Veins are contacts between lime and quartzite, one averaging 10' width being traceable one mile, carrying sulphide ore giving average assays of 9% copper and \$2.50 gold per ton. Has about 3,000' of underground openings, estimated to show 50,000 tons of ore.

COPPER RIVER MINING CO.

ALASKA.

Office: 1347-25 Broad St., New York. Capitalization \$50,000,000. F. M. Bradshaw, president; F. C. Helm, secretary and treasurer; F. M. Bradshaw, F. C. Helm, Hon. W. F. Bay Stewart, Hon. Robt. Gwynne, Jr. and John Q. Denny, directors. Lands, 188 claims, area 2,360 acres, and also lays claim, apparently without the slightest ground, to 12 other claims, area 240 acres, carrying the "Bonanza" mine, which shows bornite and chalcocite, with native copper occurring in sizes from flecks up to masses of several tons weight. Lands, if any, are located about 185 miles inland, by trail, from Valdez, Alaska, and are claimed to have "plenty of wood and water, with coal in the vicinity," the timber being a sparse growth of spruce and cottonwood, and the coal lignite. Properties claimed by this company include the Bonanza, Nicholai, Kinnecot and Jumbo groups. The Bonanza group,

claimed by and in actual possession of the Alaska Copper & Coal Co., and also claimed by the Chittna Exploration Co., is the principal prospect, this giving an exceptional showing of copper ore. The Kinnecot group has 31 claims, 5 miles from the head water of the Kinnecot river in the Kinnecot mountains. The Nicholai group, 7 claims, 7 miles from the Kinnecot, is said to show a fissure vein. Company and its alleged property are fully described in Vol IV. Company is regarded as a stock-jobbing scheme of the most brazen sort, and its promoters considered as a more than doubtful lot.

COPPER ROCK GOLD MINING & MILLING CO. COLORADO & WYOMING.

Office: 802 Wainwright Bldg., St. Louis, Mo. Mine offices: Sunset, Boulder Co., Colo., and Encampment, Carbon Co., Wyo. Capitalization \$1,500,000, shares \$1 par. H. Lee Servoss, president; Dan. G. Kirshbaum, secretary and manager; Emory Young, superintendent. The Colorado property, 60 acres, in the Sugar Loaf district, near Sunset, has a 300' shaft showing ores carrying good assay values in copper, gold and silver. The Wyoming property, 120 acres, known as the Copper Link group, has a 200' shaft, showing a little leached ore, with an 8x10' hoist, and a sawmill. Wyoming claims considered promising.

COPPER ROCK & GOLD QUARTZ MINING CO. ARIZONA.

Mine office: Bisbee, Cochise Co., Ariz. S. J. Miller, superintendent. Lands, sundry claims on the porphyry side of Tombstone Canyon, in Bisbee, on which only annual assessment work has been done heretofore. Company said to plan regular development work for 1905.

COPPER SELECTION SYNDICATE, LTD. AUSTRALIA.

Offices: 257, Winchester House, London, E. C., Eng. H. J. Dixon, secretary. Capital, nominal, £15,000. Holds sundry options on property of the Great Cobar Copper Mining Syndicate, Ltd.

COPPER STAR MINING CO. COLORADO.

Office: 60 State St., Boston, Mass. Mine office: Salida, Chaffee Co., Colo. Capitalization \$500,000, shares \$1 par. Eugene B. Estes, president; Edwin Wallace, secretary and general manager. Lands, about 180 acres. Company began paying dividends of 2 cents per share while selling stock at \$1 per share, and came to grief, like all other mining companies that are rotten before they are ripe.

COPPER STATE MINING CO. WYOMING.

Letter returned unclaimed from former office, Encampment, Wyo.

COPPER STATE & RED METAL CLAIMS. MONTANA.

Sundry claims at Stone, Granite Co., Montana, said to show ore assaying 17% copper.

COPPERTOWN MINING & SMELTING CO. CALIFORNIA.

Office: 211 Examiner Bldg., San Francisco, Cal. Mine office: Hornitos, Mariposa Co., Cal. Capitalization \$250,000, shares \$1 par. C. H. Street, president; T. J. Kerrigan, superintendent. Is developing La Victoria mine, which has 3 shafts, each of about 200', also a 400' tunnel. Employs about 20 men. Vein matter, 300' to 600' wide, is of schistose diabase, between grano-diorite walls, showing malachite, azurite, cuprite, bornite and tetrahedrite. Vein has a heavy gossan capping. All ores, including the gossan, are

more or less auriferous. Was once a considerable producer, employing 300 men, circa 1865. Also owns the Hope mine, near Sonora, Tuolumne Co., Cal., a gold mine with new 10-stamp mill.

COPPER VEIL MINING CO.**WASHINGTON.**

Letter returned unclaimed from former mine office, Index, Snohomish Co., Wash. Lands, said to be 52 claims, with 6 tunnels, longest 250', in vicinity of Index.

COPPER VENTURE SYNDICATE, LTD.

Offices: 10, St. Helen's Place, London, E. C., Eng. Cannot be learned that company owns any copper property.

COPPER WORLD MINING CO.**CALIFORNIA.**

Office: Wilcox Block, Los Angeles, Cal. Geo. H. Sisson, president, Geo. D. Copeland, secretary; E. M. Clark, superintendent. Lands, sundry claims in the Clark mining district, 37 miles northwest of Manvel, San Bernardino Co., Cal., with about 3,000' of shafts and tunnels, showing considerable lenses of oxide ores between porphyry and limestone, these being claimed to average 12% to 15% copper. Has a 50-ton water-jacket blast furnace at Bailey Wells, 5 miles from mine. Company in bad shape financially, with prospects of bankruptcy, at last accounts.

COPPER WORLD MINING CO.**NORTH CAROLINA.**

Merged, 1903, in Carolina King Mining Co.

COPPER WORLD MINING & SMELTING CO.**WASHINGTON.**

Office: care of Jerome L. Drumheller, Spokane, Wash. Letter returned unclaimed from former mine office, Loomis, Okanogan Co., Wash. John Wentworth, superintendent. Organized 1903, with capitalization \$3,000,000. shares \$1 par. Said to have a large body of sulphide ore giving good assay values.

COPPER WORLD EXTENSION MINING CO.**WASHINGTON.**

Office: 605 New Hayden Bldg., Columbus, Ohio. Mine office: Loomis, Okanogan Co., Wash. Organized 1904, under laws of Washington, with capitalization \$1,500,000, shares \$1 par. Walter A. Boyle, president; Edward H. Caylor, vice-president and fiscal agent; Alfred L. Corman, secretary-treasurer, Henry Bahrs, mine manager. Lands, 8 claims, area 160 acres, on Palmer Mountain, giving assays from selected ore of 21.7% to 31.1% copper and \$2.70 gold per ton. The Iron Mask claim, slightly developed, makes a favorable showing.

COPPER ZONE MINING CO.**NEW MEXICO.**

Company was dispossessed of its lands, and probably is dead.

SOCIEDAD MINERA COQUIMBANA.**CHILE.**

Mine office: La Serena, Coquimbo, Chile. Property includes the Rosario, Socavon and other mines, supposed to be idle.

CORA-ROCK ISLAND MINING CO.**MONTANA.**

Mine office: Butte, Silver Bow Co., Mont. Is a subsidiary corporation of the United Copper Co., which holds 95% of the capital stock. Property includes the Cora and Rock Island mines, producing about 10,000 tons of ore monthly. Main shaft, 1,200', with best values below 1,000', carrying smelting ore rich in silver. Employs about 250 men.

CORBIN COPPER MINING CO.**MONTANA.**

Mine office: Corbin, Jefferson Co., Mont.

CORBIN-MONTANA COPPER MINE CO.**MONTANA.**

Mine office: Corbin, Jefferson Co., Mont. Organized 1904, under laws of Utah, with capitalization \$600,000, shares \$2 par. Arthur H. O. Bird, president; C. H. Post, secretary-treasurer. Lands, sundry claims in the vicinity of Corbin.

CORBIN-WICKES COPPER MINING CO.**MONTANA.**

Proposed new title of Colorado Mining & Development Co.

CORDENERA MINE.**MEXICO.**

Mine office: Suaqui Grande, Sonora, Mex. W. S. Morrow, manager. Ores carry silver and copper. Has steam power and 5-stamp mill.

CORDILLERO MINING CO.**BRITISH COLUMBIA.**

Office: care of A. W. More, 332 Lumber Exchange, Seattle, Wash. Lands, 3 claims, adjoining the Cornell mine, on Texada Island, B. C.

CÓRDOBA EXPLORATION CO., LTD.**SPAIN.**

Property is now operated by Cerro Muriano Mines, Ltd.

GEWERKSCHAFT CORIOLAN.**GERMANY.**

Mine office: Wissen am Sieg, Rheinprovinz, Germany. Has one shaft, developing ores carrying lead, copper, antimony and cobalt.

CORK MINERAL DEVELOPMENT SYNDICATE, LTD.**IRELAND.**

Offices: 9, Gracechurch St., London, E. C., Eng. A. J. M. Brown, secretary. Registered June 22, 1903, with capitalization £15,000, shares £1 par, to lease for 31 years a tract of 1,040 acres of copper-bearing ground on Mount Gabriel, County Cork, Ireland.

CORNELIA COPPER CO.**ARIZONA.**

Office: 802 Fullerton Bldg., St. Louis, Mo. Mine office: Gila Bend, Pima Co., Ariz. W. R. Ramsey, president; John R. Boddie, secretary. Organized May 14, 1900, under laws of Arizona, with capitalization \$100,000, shares \$10 par. No cash on hand, and no liabilities. Lands, 6 patented claims, area 100 acres, developed by shafts of 125' and 225' and tunnels of 30' and 60'. Has steam power. Idle.

CORNELL MINE.**BRITISH COLUMBIA.**

Operated by Van Anda Copper & Gold Mines Co.

CORNELL GOLD, SILVER & COPPER MINING CO.**NEW MEXICO.**

Mine office: Silver City, Grant Co., N. M. Frank F. Ross, secretary. Lands, including the Owl mine, are in the Gold Gulch district.

MINA EL CORNETA.**MEXICO.**

Mine office: San Miguel Mezquital, Zacatecas, Mex. Henry Winninghoff, owner. Is a prospect, under development.

CORNETT MINE.**CALIFORNIA.**

Office: care of H. W. Cornett, owner, Merced, Mariposa Co., Cal. Vein matter is schistose diabase, with 3' pay-streak carrying ore, mainly chalcopyrite, assaying 17% to 23% copper, and \$2.25 to \$4.50 gold per ton.

CORNISH COPPER CO.

Organized December, 1903, under laws of Connecticut, with capitalization \$300,000, by Andrew B. Hardryx, et al, of New Haven, Conn. Location of property, if any, not learned.

CORNUCOPIA COPPER CO.

OREGON.

Mine office: Quartzburg, Baker Co., Ore. Idle at last accounts.

CORNUCOPIA GOLD & COPPER MINING CO.

ARIZONA.

Mine office: Cherry, Yavapai Co., Ariz. E. R. Hotzenpiller, president and general manager. Idle at last accounts.

CORNWALL COPPER MINES.

MISSOURI.

Located in Ste. Genevieve county, Missouri, and were worked on a fair scale, circa 1860. Ores are greater in variety than in quantity, those found including cuprite, malachite, azurite, chalcocite, bornite, covellite, chalcopryrite, melaconite, chalcantinite and chrysocolla.

COMPañIA CORO CORO DE BOLIVIA.

BOLIVIA.

Mine office: Coro Coro, La Paz, Bolivia. This company works native copper occurring in beds of conglomerate, and is the largest producer of Bolivia, making yearly about 1,500 tons of mineral averaging 85% fine copper. A little cuprite and chalcocite occur also, and silver, found with the copper in native form, as at the Lake Superior mines, is an important by-product. Has steam power and small smelter, employing several hundred men.

CORONA CONSOLIDATED GOLD & COPPER CO.

ARIZONA.

Office: Union Blk., Prescott, Ariz. Organized under laws of Arizona, with capitalization \$2,000,000, shares \$1 par. A. J. Head, president; W. S. Goldsworthy, secretary. Lands, 15 claims, unpatented, area 300 acres, in the Turkey Creek district of Yavapai county, Arizona, showing 12 veins, opened by 7 shafts, of 40' to 60' depth each, with a large open-cut and tunnels of 50', 110' and 450', showing a vein of 4' to 6' width, giving ores assaying 4% to 16% copper, 2 oz. to 6 oz. silver and \$11 to \$36 gold per ton.

CORONA COPPER MINING CO.

WISCONSIN.

Office: 804 Winthrop Bldg., Boston, Mass. Property is the mine in Douglas county, Wisconsin, formerly held by the Chippewa Copper Mining Co., of which the present company is a reorganization. Is nearly out of debt and nearly out of cash.

CORONA GOLD & COPPER CO.

NEW MEXICO.

Lands, sundry claims near Santa Rita, Grant Co., N. M. Company reorganized, 1903, with O. H. Baum as president.

CORONADO GOLD & COPPER MINING CO.

ARIZONA.

Office: care of Chas. P. Myers, president and general manager, Prescott, Ariz. Lands, 14 claims, area 285 acres, including the Black Warrior group, in the Black Hills district of Yavapai county, Arizona, said to have considerable ore in sight.

CORONADO MINING CO.

ARIZONA.

Office: 10 P. O. Square, Boston, Mass. Mine office: Metcalf, Graham Co., Ariz. Employs about 50 men. Organized 1902, under laws of Maine, with capitalization \$3,000,000, shares \$10 par, with 200,000 shares unissued. Controlled, through ownership of majority stock, by Standard Consolidated Copper Co. Wm. B. Thompson, president; J. W. Belches, vice-president; Wm. J. Palmer, secretary; Henry L. Westlake, general manager; Geo. Morrison, superintendent. Lands, 23 claims, area about 400 acres. Ore is slightly auriferous and argentiferous chalcopryrite, developed by several shafts and tunnels. Property adjoins the Detroit and Arizona mines, and

is supposed to carry the continuation of the famous Coronado vein. The Emerald claim shows a large ore body giving average assays of about 9% copper. Property is regarded as well managed and promising.

NUEVA COMPAÑIA MINERA DE CORPUS CHRISTI. MEXICO.

Mine office: Matehuala, San Luis Potisi, Mex. W. B. A. Dingwall, president and manager. Ores carry silver, lead, gold and copper. Principal development is by an 1,800' tunnel. Employed upwards of 100 men at last accounts.

SOCIEDAD DE MINAS y FUNDICIONES DE CORRALES. ARGENTINA.

Mine office: Chilecito, Rioja, Argentina. Has auriferous and argenterous copper ores, with 12-ton smelter and gas power. Employed about 100 men at last accounts.

JOSÉ FRANCISCO COREA. CHILE.

Office and mine: San Fernando, Colchagua, Chile. Has steam power and a small smelter, employing about 100 men and securing a limited product, shipped as matte.

CORTLAND GOLD & SILVER MINING CO. COLORADO.

Mine office: Ohio, Gunnison Co., Colo. Victor Reno, superintendent. Ores carry gold, silver, lead, copper and zinc. Has gasoline power.

CORUÑA COPPER CO., LTD. SPAIN.

Offices: Dashwood House, London, E. C., Eng. Mine office: Pino Arca, Coruña, Spain. R. F. A. Malabar, secretary. Registered April 19, 1901, with capitalization £1,000,000, shares £1 par; issued, £906,757. Lands, 3,040 acres, including the Santiago mines, bought for £900,000 in shares. Property was promoted by the notorious Ernest Terah Hooley. Ores occur in immense bodies, carrying about 2% copper, and are said to be refractory. Property was undergoing a little development work only, at last accounts.

CORY BROS. MINING CO. MONTANA.

Office: Helena, Deer Lodge Co., Mont. Lands, sundry copper and gold claims on Beaver Creek, north of Helena.

COSTELLO COPPER CO. ARIZONA.

Office: care of Martin Costello, Tombstone, Cochise Co., Ariz. Organized August, 1903.

COTTONWOOD COPPER MINES. NEVADA.

Lands supposed to be located in vicinity of Azurite, Churchill Co., Nev.

COW CREEK COPPER MINING CO.

Address: care of Herman C. Ridder, Denver, Colo. Location of property, if any, unknown.

COXHEATH MINE. NOVA SCOTIA.

Owned by Cape Breton Copper Co., Ltd.

CRACKER JACK MINE. ARIZONA.

Mine office: Payson, Gila Co., Ariz. A. Lockwood, owner.

CREEDE COPPER MINING CO. WYOMING.

Letter returned unclaimed from former mine office, Rawlins, Carbon Co., Wyo.

CRESCENT COPPER CO. UTAH.

Mine office: Park City, Summit Co., Utah.

CRESCENT COPPER CO.**WYOMING.**

Office and mine: Encampment, Carbon Co., Wyo. G. E. Heber, superintendent. Lands, about 100 acres, adjoining the Kurtz-Chatterton mine, 7 miles from Encampment. Has an 800' tunnel. Idle.

CRESCENT COPPER MINING CO.**ARIZONA.**

Office: care of Carl Clausen, president and general manager, Bisbee, Ariz. W. A. Eckerly, secretary; A. C. McDonald, superintendent. Organized 1903, under laws of Arizona, with capitalization \$2,500,000, shares \$2.50 par. Lands, 12 claims, in Tombstone Canyon, about 2 miles northwest of Bisbee, showing oxide and carbonate ores, and small quantities of chalcocite and iron ore, with quartz gangue, giving average assays of 19.1% copper and 41 oz. silver per ton, from a vein said to range 8' to 30' in width.

MINA EL CRESTON DE COBRE.**MEXICO.**

J. J. McCullom and J. L. Sheppard, owners. Said to show rich oxide and carbonate ores, and to be located in La Dura district of Sonora, Mex., but letter addressed to La Dura returned by postmaster with notation that no such property exists in that district.

CROESUS GOLD & COPPER MINING CO.**IDAHO.**

Office: Beatrice, Neb. Mine office: Hailey, Blaine Co., Idaho. W. G. Page, superintendent. Ores carry gold, silver and copper. Has steam power and a 10-stamp mill, employing about 20 men at last accounts.

CROFTON SMELTER.**BRITISH COLUMBIA.**

Owned and operated by Northwest Smelting Co.

CRONA COPPER CO.**COLORADO.**

Office: Clay Centre, Kan. Mine office: Lyons, Boulder Co., Colo. Chas. A. Southwick, president; C. W. Strong, secretary and treasurer. Organized, 1901, under laws of New Mexico, with capitalization \$1,000,000, shares \$1 par. Lands, 14 claims, 2 miles from Lyons. Was developing at last accounts.

CRONNEBANE MINES.**IRELAND.**

Sold to the Ovoca Copper Syndicate, Ltd.

CROWL CREEK COPPER MINING CO.**AUSTRALIA.**

Mine office: Shuttleton, Nymagee district, New South Wales, Australia. J. Booth, manager. Has steam power concentrator and smelter with reverberatory furnaces. Ores averaged about 9.5% copper in 1904, and monthly production was 35,000 to 40,000 lbs. refined copper during latter months of the year.

CROWN LYELL, LTD.**TASMANIA.**

Offices: 45, Renfield St., Glasgow, Scotland, and 70, Queen St., Melbourne, Australia. Mine office: Mount Lyell, Montague Co., Tasmania. Employs 12 men. Capital, nominal, £300,000; issued, £155,007. J. B. Sutherland, secretary; John Wedd, mine manager. Has steam power. Has a 719' tunnel and 514' shaft, latter showing some fair ore, which is to be developed. Employed 18 men in 1904.

CROWN POINT MINING CO.**WASHINGTON.**

Promoted by the Pioneer Investment & Trust Co., 709 Grant Bldg., Los Angeles, Cal. Said to have claims in Chelan county, Washington, showing ores of silver, copper and molybdenum.

COMPANIA MINERA DE LA CRUZ.**MEXICO.**

Mine office: La Cruz, Tamaulipas, Mexico. J. H. Gonzales, manager. Produces copper and lead ore upon a considerable scale, and employs about 200 men.

CRYSTAL MINING CO.**WASHINGTON.**

Office: 45 Jamison Blk., Spokane, Wash. Mine office: Bolster, Okanogan Co., Wash. John Gray, superintendent. Ores carry gold, silver, lead and copper. Has steam power and small smelter.

CRYSTAL LAKE GOLD & COPPER**COLORADO.****MINING & SMELTING CO.**

Office: 915 Barristers' Hall, Pemberton Sq., Boston, Mass. Philip G. Dawson, president; Kendric P. Crawford, treasurer and general manager; A. D. Wise, secretary. Capitalization \$1,500,000, shares \$1 par. Lands, 10 claims, 4 on Hotchkiss Mountain, south of Lake City, Hinsdale county, Colorado, others in vicinity, showing ores of gold, silver, copper and lead.

CRYSTAL MOUNTAIN MINING & DRAINAGE CO.**COLORADO.**

Mine office: Crystal, Gunnison Co., Colo. Geo. W. Melton, superintendent. Ores carry copper, gold and silver. Mine is opened by tunnel, and has steam power.

CUAHEMOC MINING CO.**MEXICO.**

Office: care of J. Albert McKay, secretary; 508 Germania Bank Bldg., Pittsburg, Pa. Mine office: Ocotlán, Oaxaca, Mex. Organized, 1904, under laws of West Virginia, with capitalization \$400,000. James McKay, president; Frank A. Vickery, treasurer; Guillermo W. Thompson, manager. Lands, 21 pertenencias, showing promising ore bodies carrying gold, silver, lead and copper.

CUBA MINING CO.**UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. John Swanson, superintendent. Has copper-gold ores, opened by tunnel. Has steam power.

CUBAN EXPLORATION CO.**CUBA.**

Office: 11 Nassau St., New York. Mine office: El Caney, Santiago, Cuba. W. A. Dennis, vice-president and general manager. Is reopening old and developing new copper properties in the vicinity of Santiago de Cuba.

CUBAN MINING & DEVELOPMENT CO.**CUBA.**

Offices: Dashwood House, London, E. C., Eng. Mine office: Bahía Honda, Pinar del Rio, Cuba. J. J. Jonas, chairman; G. W. Hoghton, managing director in London; F. Kohly, managing director in Havana; Frederick J. Rich, mine manager; A. Mitchell, secretary. Registered March 18, 1902, to take over the business of the Cuban Exploration Syndicate, Ltd., with capitalization £250,000, shares £1 par; issued £150,157. Debentures, £150,000 at 5%. Lands, 2,766 acres of mineral land, near Bahía Honda, two gold claims in the province of Santa Clara and the Hacienda Nazareno, with frontage on the bay. The copper lands had 5 old shafts, with extensive workings in very bad condition. Two new shafts have been sunk and considerable new development work secured with a force of about 150 men.

CUBANA CONSOLIDATED COPPER CO.**MEXICO.**

Mine office: Arizpe, Sonora, Mex. Organized Jan. 6, 1903, under

laws of Arizona, with capitalization \$500,000, shares \$1 par. Don Ray, president; A. H. Rose, vice-president; M. A. Nurse, secretary; Geo. H. McLean, superintendent. Lands, 244 pertenencias, area 602 acres, bought for \$20,000, in the Arizpe district, showing 6 ore bodies with widths of 4' to 20', of which 3 are being developed, these carrying estimated average values of 12% copper, 10 oz. silver and \$2 gold per ton, opened by 6 shafts, deepest 102' and a number of tunnels, longest 250' and 575', with 1,415' of underground openings. Uses horse power. Mine is about 40 miles from La Cananea, the nearest railroad point, which is connected with the mine by a good wagon-road. Sample carloads of ore smelted gave returns of 23% copper, with fair gold and silver values. Property considered of considerable promise.

CUCHARAS MINING CO.**MEXICO.**

Mine office: Acaponeta, Tepic, Mexico. J. W. Winston, manager. Operates the San Juan copper mine, opened by shaft and tunnel. Has steam power and 40-ton smelter. Employs about 50 men. Production, 1903, was 200,618 lbs. fine copper.

MINAS LA CUEVA y PEDRO ESTABAN.**MEXICO.**

Mine office: Mazapil, Zacatecas, Mexico. Owned by estate of J. S. Morrison. Manuel R. Orozco, manager. Produce copper as a by-product from silver-gold ores. Have steam power and 25-ton smelter. Employ about 100 men.

LA CUIVRE GROUP.**BRITISH COLUMBIA.**

Owned by E. A. Cleveland, Vancouver, B. C. Located on Princess Royal Island, Skeena River Division, Cassiar District, B. C. Development limited to tunneling. Probably idle.

CULLIGAN MINE.**WISCONSIN.**

A property in Douglas county, Wisconsin, which produced a little high-grade copper rock, (said to have come from a Michigan mine) in 1899.

CULLOWHEE COPPER CO.**NORTH CAROLINA.**

Office and mine: Cullowhee, Jackson Co., N. C. Capitalization \$100,000. D. D. Davis, president; R. E. Bowen, treasurer; Thos. A. Cox, secretary; Albert Lord, superintendent. Has steam power and Sullivan air compressor, with rock drills and necessary mine buildings. Said to have a very fair showing of ore.

CUMARAL MINES & DEVELOPMENT CO.**ARIZONA.**

Office: Oakland, Cal. Mine office: Old Glory, Pima Co., Ariz. E. F. Staples, superintendent. Has auriferous and argentiferous copper ores, with gasoline power and employed about 15 men, at last accounts.

CUPRITE COPPER CO.**ARIZONA.**

Office: Clifton, Graham Co., Ariz. Organized 1904, with capitalization \$1,000,000. Chas. E. Stevenson, superintendent. Lands are a group of well located claims near Metcalf, Graham Co., Arizona, from which sundry smelter shipments of ore carrying 20% to 30% copper and up to \$5 gold have been made. Slight development has been secured by shaft and tunnel.

CUPRITE COPPER CO.**ARIZONA.**

Lands, near Vail, Pima county, Arizona, sold to the defunct Golden Rule Copper Mining & Smelting Co.

CUPRITE MINING CO.

Mine office: Holmes, Albany Co., Wyo. Was developing, at last accounts.

CURTIN DAVIS PROPRIETARY CO.**WYOMING.****TASMANIA.**

Offices: 39, Queen St., Melbourne, Australia, and Finsbury House, London, E. C., Eng. Mine office: Dundas, Tasmania. W. Orr, chairman; E. Habben, secretary. Registered June 24, 1896, under no liability act of Victoria, with capitalization £200,000, shares £1 par; issued, £182,229. Lands, 180 acres of argentiferous copper lands, with a developed mine leased on tribute.

CUSHING y WALKUP.**MEXICO.**

Mine office: Otaez, Durango, Mex. Emil Bruckhold, superintendent. Operate the Quien Sabe, Promontorio and other mines, employing about 200 men. Development is by tunnels. Mines have steam power and 50-ton smelter with a single matting furnace. El Cobre mine of this firm has been sold to the Compañía Minera de Cobre de Durango. Production of copper is small, as copper is used merely as a carrier in making an iron-copper matte averaging 15% copper, 300 to 400 oz. silver and 12 oz. to 15 oz. gold per ton.

CYPRESS MINE.**ARIZONA.**

Mine office: Bigbug, Yavapai Co., Ariz. Owned by Joseph Mayer, et al. Frank Thornton, superintendent. Is said to have a good showing of copper gold-silver ores.

DAIRA MINE.**JAPAN.**

Mine office: Fujikoto-mura, Yamamoto-gori, Ugo, Japan. Mine was opened, 1862, on numerous veins without fixed strike or dip, and frequently crossing, in andesite country rock. Ores are galena, chalcopyrite, sphalerite and iron pyrites. Product is chiefly silver and lead, with a trivial amount of copper as a by-product.

DAKOTA CALUMET COMPANY.**SOUTH DAKOTA.**

Office: Lima, Ohio. Mine office: Sheridan, Pennington Co., S. D. Samuel A. Baker, vice-president; Wm. J. Booth, secretary; H. C. Ellison, treasurer. Organized 1902, under laws of South Dakota, with capitalization \$3,000,000, shares \$1 par. Is controlled, through stock ownership, by the Continental Copper Co. Lands, 19 patented claims, including the Lilian group, area 179 acres, also a 27-acre mill and smelter site, with total landed holdings of 319 acres. Has shafts of 40', 80' and 100' and a tunnel of 380', giving total underground openings of 600', on the strength of which a 150-ton smelter has been built. Has a 40-h. p. hoist, good for depth of 1,000', a 10-drill Sullivan air compressor and 5-power drills. Buildings include a carpenter shop, smithy, laboratory and three dwellings. The smelter is a quarter of a mile from the mine and several hundred feet lower, of wood on stone foundations, connected with the mine by a Bleichert aerial tram. Smelter has a Colorado Iron Works 150-ton blast furnace with 120-h. p. steam plant and is planned to turn out pimple copper of 80% tenor.

DALANE SOELV-OG-KOBBERGRUBER.**NORWAY.**

Mine office: Brunkeberg Sogn, Norway. Is irregularly worked, being a small producer of silver and copper, when operated.

DALKEY MINE.**AUSTRALIA.**

Office: Port Adelaide, South Australia. J. Johnson, manager. Has steam power, and employed about 20 men at last accounts.

DALTON & LARK MINING & MILLING CO.**UTAH.**

Absorbed by Bingham Consolidated Mining & Smelting Co.

DALY COPPER MINING CO.**AUSTRALIA.**

Mine office: Leighs Creek, South Australia. F. Sutherland, manager. Has steam power, and employed about 20 men at last accounts.

DALY MINING CO.**MONTANA.**

Office: care of John D. Ryan, Butte, Mont. Mine office: Copperopolis, Meagher Co., Mont. Organized 1903, under laws of Arizona, with capitalization \$1,000,000, to take over sundry mining properties of the Marcus Daly estate in Meagher, Silver Bow and Lewis & Clarke counties, Montana. Properties in Meagher county are the Copperopolis, Daly, North Pacific, Darling Fraction and others. The Copperopolis mines have 3 shafts, deepest 500', with good surface equipment, and have been small producers of high-grade ore for many years, until circa 1903. Idle at last accounts.

DALY JUDGE MINING CO.**UTAH.**

Office: Salt Lake City, Utah. Mine office: Park City, Summit Co., Utah. Organized 1901, under laws of Utah. Has authorized a \$300,000 bond issue running 3 years from Jan. 1, 1904 at 7%. Employs about 250 men. John Daly, president; O. J. Salisbury, general manager; John McSorley, superintendent. Lands, 146 claims, area 715 acres, including the Anchor mine, with three ore bodies, known as the South, Contact and North veins, the middle or Contact vein being the principal and showing a well defined and persistent outcrop, traced 3,000'. Property also included the Bonanza group, regarded as valuable but lacking development. Ore values are mainly in silver and lead, with a little copper as a by-product. The 6,000' Anchor tunnel, for operating and drainage purposes, is connected with the 1,200' level of the 1,650' three-compartment Anchor shaft, which has a powerful hoist operating double-deck cages. The mine was retimbered throughout, at heavy cost, in 1903. The Anchor workings are said to show about 200,000 tons of ore blocked out for stoping. The mine has about 8 miles of underground openings, and makes 300 to 450 gallons of water per minute, this being sufficient for the use of the concentrator, and water is supplied, under contract, to the Daly West mine. There is also a lake, two miles from the mine, affording an alternative water supply. The concentrator has a capacity of about 300 tons daily, and the Sherman slimes process has proven highly satisfactory, reducing the crude ore about 6 into 1, concentrates having a net value of approximately \$35 per ton. Development for the past year is said by management to have been satisfactory. Property considered good and management stands well, but is too secretive about the work and results.

DALY WEST MINING CO.**UTAH.**

Office: 161 Main St., Salt Lake City, Utah. Mine office: Park City, Summit Co., Utah. Employs about 500 men. Organized Feb. 14, 1902, under laws of Colorado, with capitalization \$3,600,000, shares \$20 par. J. Ernest Bamberger, president and general manager; W. H. Dickson, vice-president; J. Barnett, secretary; W. S. McCornick, treasurer; J. A. McCaskell, general superintendent; John A. Kirby, mine superintendent; F. W. Sherman, mill superintendent; Corporation Trust Co. of New York, First National Bank of Boston and McCornick & Co. of Salt Lake City, registrars; McCornick

& Co. of Salt Lake City, American Loan & Trust Co. of Boston and North American Trust Co. of New York, transfer agents. Has paid dividends of \$4,635,000 to Dec. 31, 1904. Lands, 50 patented claims, area 250 acres, in the Uintah district, showing extensive ore bodies carrying good values in silver, lead, copper and gold. In 1902 the ores averaged about 2% copper. Ore, as produced, is about equally divided between smelting and concentrating grades. The mine has three main veins, of 4' to 6' minimum and up to 40' maximum width. Mine has an extreme depth of 1,700', with upwards of 10 miles of underground openings. Equipment includes all necessary shops, a bunk-house, dwellings, etc. The Quincy mine, bought 1902, has not come up to expectations. An agreement has been made with the owners of the Ontario drainage tunnel by which the tunnel will be driven under the Daly West, unwatering the lower levels, about 600' below the present workings.

The concentrator, of 300 tons daily capacity, is equipped with crushers, rolls, two 5' Huntington mills, Wilfley tables, and an automatic ore-sorting belt. The practice of this concentrator, under the management of Mr. Sherman, is exceptionally advanced, and results secured on complex ores are not exceeded in any American reduction plant. The new tailings mill, completed 1904, is 56x82' in size, standing about 400' northeast of the concentrator, and has a 5' Huntington mill for regrinding, 7 slime, settling and classifying tanks, 2 two-compartment jigs, 6 concentrating tables and 1 Wilfley table. It is expected that this mill will treat the enormous tailings dump of the property at a cost of 15 cents to 20 cents per ton, at a net profit of 25 cents to 50 cents per ton, at the rate of 200 to 250 tons daily. An ample water supply for both mills is secured, under contract, from the Daly Judge mine.

The company paid monthly dividends until the end of 1904, but will pay quarterly dividends for 1905, with a considerable reduction in the total disbursements. During 1904 the market price of the stock broke badly, and it became apparent that this was due to "inside" selling. Shareholders were given the facts in the case rather tardily. The large reserves of high-grade ore, while not exhausted, are much impaired, and reliance for the future must be placed on the large bodies of low-grade milling ore, with the possibility of finding new high-grade ore bodies. The mine has about 3 years supply of concentrating ore blocked out, with further larger quantities of ore of similar grade available for future development.

Production for 1904 showed a marked falling off, both in quality and quantity, with total net earnings of \$1,804,673, a decrease of \$577,885. Dividends for the year were \$1,044,000, or \$192,318 more than earnings, reducing the surplus to \$262,679. Production for 1904 was 2,082,000 lbs. copper, with large products of lead, zinc, gold and silver.

Confidence in the mine and its management necessarily has been considerably impaired by the unfavorable developments of 1904. The management cannot be entirely relieved from responsibility in this connection as the officials were repeatedly quoted as saying that all was well, at a time when all was not well, owing to the rapid exhaustion of the mine's reserves of high-grade ore. The Daly West has made the mistake of skimming its

cream in a few seasons, and must put up with plain milk for the future, or until more cream is found. This mistake is by no means an uncommon one, but works a great injustice to the shareholders who bought into the property at top prices, on the strength of the large and steady dividends. The mine is a very valuable one, and should remain a large dividend payer for years to come, but cannot maintain the too rapid pace set in 1903 and 1904.

DAMARALAND COPPER SYNDICATE, LTD. GERMAN SOUTHWEST AFRICA.

In voluntary liquidation.

DANES LEA MINING CO. CALIFORNIA.

Office: care of W. C. Harland, president, San Diego, Cal. Mine office: Encinitas, San Diego Co., Cal. W. H. McKinnon, manager. Lands, 20 claims, 8 miles east of Encinitas, with shafts of 100' and 280', also a tunnel. Has a 3' vein of medium-grade chalcopryite, traversing porphyry. Has gasoline power.

DANVILLE & VIRGINIA COPPER MINING CO. VIRGINIA.

Merged, 1903, in Carolina King Mining Co.

DARNELL MINING & MILLING CO. WASHINGTON.

Mine office: Kalama, Cowlitz Co., Wash. H. M. Stevens, superintendent. Ores carry gold, silver and copper. Has steam power, concentrator and 50-ton cyanide plant, employing about 40 men at last accounts.

DAULTON COPPER CO. CALIFORNIA.

Mine office: Daulton, Madera Co., Cal.

DAVENPORT MINE. WASHINGTON.

A prospect, near the head of Horseshoe Basin, Washington. A ton of ore shipped to smelter gave returns of \$69, in lead, copper, silver and gold.

DAVID HARUM COPPER CO. TEXAS.

Floyd B. Wilson writes that company is to be reorganized.

ERZBERGWERK DAVID-VEREINIGUNG. GERMANY.

Office: Köln, Westfalen, Germany. Carl Hobert, Jr., president. Has lead-copper ores, opened by one pit and one shaft.

DAVIS MINING & SMELTING CO. CALIFORNIA.

Office: care of Dr. J. Doan Carey, secretary, Los Angeles, Cal. Mine office: Oro Grande, San Bernardino Co., Cal. Lands, 3 copper claims and 9 gold claims. Had an 80-ton smelter with water-jacket blast furnace, supposed to have been sold to the Southwestern Smelting Co.

DAWES RANGE COPPER & GOLD MINING CO. AUSTRALIA.
OF QUEENSLAND. (NO LIABILITY).

Offices: 78, Queen St., Melbourne, Australia. Hon. Henry Foster, J. P., chairman; John Brown, manager; Stobbs & Roscoe, 78, Bishopsgate St., London, E. C., England, British agents. Organized January, 1900, under laws of Victoria, with capitalization £300,000, shares £1 par; issued, £250,000. Lands, 240 acres, in the Gladstone district of Queensland. Idle, owing to lack of funds.

DAY DREAM & BRETONARTE COPPER MINING CO. AUSTRALIA.

Mine office: Leighs Creek, South Australia. F. M. Montague, manager. Has steam power and was said to employ about 50 men at last accounts.

DEADWOOD GOLD & COPPER MINES CO.**SOUTH DAKOTA.**

Office: Deadwood, S. D. Organized, 1904, with capitalization \$1,000,000.

DECATUR COPPER MINING CO.**ARIZONA.**

Office: 503 North Main St., Decatur, Ill. Mine office: Jerome, Yavapai Co., Ariz. Organized 1897, under laws of Arizona, with capitalization \$2,000,000, shares \$1 par. W. J. Wayne, president; Frank P. Wells, vice-president and treasurer; Geo. R. Bacon, secretary; W. S. Owens, superintendent. Lands, 10 claims, area 180 acres, also 10-acre millsite, 10-acre smelter site and sundry other lands, in the Verde district, showing 10 fissure veins and lenses, of which 4 are being developed, these having an average width of 4' and giving average assays of 5% to 8% copper, 20 oz. silver and \$10 gold per ton. Has oxide and carbonate ores near surface with sulphides below 60' depth, opened by 6 shafts, deepest, 280', and tunnels of 70' and 150'. Also has a free-milling gold vein in the Mineral Point district. Has gasoline power. Officers are men of good standing and property considered promising, but company is suffering from the common trouble of lack of funds.

DEDHAM COPPER MINING CO.**WISCONSIN.**

Office: West Superior, Wis. Organized November, 1902, under laws of Wisconsin, with capitalization \$1,300,000, shares \$25 par; debentures, \$150,000 authorized at 6%. Abram G. Ross, president; Wm. C. Burke, secretary. Lands, 320 acres, also a 12-acre millsite, with waterfall of about 2,400 h. p. available. Has steam power and air compressor. Property was tested by 34 pits, showing 3 cupriferous amygdaloid beds, each averaging 90' width and about one-third mineralized. Is opened by a shallow shaft. Idle at last accounts.

DEEMS MINING CO.**UTAH.**

Office: Salt Lake City, Utah. Organized 1904, with capitalization \$75,000, shares 25 cents par. C. D. Rooklidge, president; A. Hanauer, Jr., secretary and treasurer. Lands include the Deems group, in the Bingham district of Salt Lake county, Utah.

DEEP RIVER GOLD MINING CO.**NORTH CAROLINA.**

Mine office: High Point, Guilford Co., N. C. W. G. Gaither, manager. Property is an old mine, carrying gold-silver-copper ores.

DEER CREEK DEVELOPMENT CO.**UTAH.**

Organized 1903, with capitalization \$125,000, shares 25c. par. John Cleghorn, president; Henry Johnson, secretary. Land, 7 claims, in the Deer Creek division of the American Fork mining district, Utah, showing a 3' to 6' fissure vein in granite, ore therefrom giving assays of 22% copper and 7 oz. silver per ton.

DEER CREEK GOLD & COPPER MINING CO.**WASHINGTON.**

Mine office: Silverton, Snohomish Co., Wash. Said to have developed a considerable body of low-grade ore, by drifts from a tunnel.

SOCIEDAD MINERA DEFENSO y TODOS SANTOS.**CHILE.**

Mine office: Taltal, Antofagasta, Chile. Daniel Olivia, superintendent. Has auriferous copper ores and employs about 40 men.

DE LAMAR-WALL MINING & MILLING CO.**UTAH.**

Controlled by Utah Copper Co.

DE LA MAR'S COPPER REFINING CO.**NEW JERSEY.**

Office and works: Chrome, Middlesex Co., N. J. Organized 1903, under laws of New Jersey, with capitalization \$2,000,000. J. R. De La Mar, president; L. Vogelstein, vice-president; W. O. Fletcher, secretary and treasurer. Plant has a refinery with a monthly capacity of 3,500 tons of copper, supplies coming mainly from Utah, Montana, Arizona and California, with odd lots picked up from other producing fields. Copper is received in slabs or cakes and cast into anodes, which are then refined electrolytically, slimes being treated in a silver refinery having filter-presses and complete equipment for the refining and parting of gold and silver. In connection with the refinery is a sulphate plant, where bluestone is produced for the requirements of the refinery. There also is a blast-furnace where rich copper ore is smelted occasionally, this being suitable for smelting tests of sample ore shipments under the best metallurgical conditions. Works are located near Arthurs' Kill, which is the lighterage limit of New York harbor, and are served by two competing railroads. The plant is practically under the control of the prominent metal-brokerage firm of Aron Hirsch & Sohn, of Halberstadt, Germany.

DELAWARE MINE.**MICHIGAN.**

An idle property in Keweenaw county, Michigan, on which sums aggregating about \$3,300,000 have been sunk by successive managements. Fully described in Vol. II.

DEL COBRE CONSOLIDATED MINING CO.**ARIZONA.**

Mine office: Florence, Pinal Co., Ariz. Organized under laws of Delaware. Lands, 15 claims, 12 miles east of Florence, held under bond and lease, opened by shaft said to be 200' in depth, showing ores carrying gold, silver and copper.

MINA DELFINA.**MEXICO.**

Office: Centro Mercantil No. 3, Mexico, D. F. Mine office: Chilpancingo, Guerrero, Mex. Paul Merienne, mine manager. Ores carry silver, gold and copper values. Has steam power and 5 stamp mill and contemplates building a small smelter. Employs about 200 men.

DEL NORTE COPPER CO.**ARIZONA.**

Office: care of Ellery R. Bassett, New Bedford, Mass. Formerly had property near Kirkland, Yavapai Co., Ariz., but supposed to have lost its lands, rendering stock worthless.

DEL NORTE COPPER CO.**CALIFORNIA.**

Supposed to have claims near Smith River, California.

DEMOCRATA MINING CO.**MEXICO.**

Office: care of H. H. Hoffman, owner, 17 East Fourth St., Cincinnati, Ohio. Mine office: La Cananea, Sonora, Mex. J. Hook, superintendent, La Cananea. This is the oldest mine at La Cananea and is surrounded by the property of the Greene Consolidated. Has a 500' tunnel, 450' shaft, steam power and 125-ton smelter. Employs about 200 men. Ores are rich, and property is supposed to be profitable. Production, 1903, was 3,747,820 lbs. fine copper.

DENN-ARIZONA DEVELOPMENT CO.**ARIZONA.**

Office: care of John G. Williams, secretary, Duluth, Minn. Mine office:

Bisbee, Cochise Co., Ariz. Organized 1905, with capitalization \$750,000, shares \$10 par; issued \$570,000. Martin Pattison, president; Thomas Bardon, vice-president; L. C. Shattuck, treasurer; Byron M. Pattison, superintendent. Lands, sundry claims immediately north of the Junction Development Co., to be tested by diamond drilling in 1905.

DENVER MINE.**ARIZONA.**

Mine office: Gilbert, Yavapai Co., Ariz. John Witherally, owner. Has gold-copper ores.

DENVER COPPER MINING & LEASING CO.**COLORADO.**

Supposed to have claims in the Morrison district of Colorado.

DENVER GROUP GOLD & COPPER CO.**ARIZONA.**

Office: 319 Douglass Bldg., Los Angeles, Cal. Mine office: Wickenburg, Maricopa Co., Ariz. Capitalization \$2,000,000, shares \$1 par. Thos. S. Wadsworth, president. Lands, 10 patented claims, area 194 acres, 12 miles northeast of Wickenburg. Mineral formation traced 6,000', with 80' to 300' width of vein matter, showing scattered parallel veins and stringers. Has tunnels of 225' and 600', also 5 prospecting shafts. Assays show 15% copper and \$10 gold per ton. Ore is sulphide, carrying a little native copper. Property considered promising.

DERBY SYNDICATE, LTD.**AUSTRALIA.**

Voluntarily liquidated.

DEROFFSKI MINE.**SIBERIA.**

A small copper producer, near Semipalatinsk, Siberia.

COMPANIA MINERA FUNDIDORA DESCUBRIDORA.**MEXICO.**

Mexican title of Descubridora Mining & Smelting Co.

DESCUBRIDORA MINING & SMELTING CO.**MEXICO.**

Office: Scranton, Pa. Mine offices: Mapimi, Durango, Mexico, and Conejos, Sinaloa, Mexico. D. Gough, general manager. The Descubridora group, at Mapimi, has a 500' main shaft, showing large quantities of basic silver-copper carbonate ore, for fluxing which silicious ores are bought in the market. Has complete steam and electric power equipment, with a 600-ton smelter built in 1902, employing about 1,000 men when in full operation, but closed down in 1903. At Conejos there are several mines and a 200-ton smelter, closed down early in 1904, a 36-mile railroad having been built recently from Conejos to Pelayo. Durango property was operated for a year by the Guggenheim Exploration Co., but turned back to owners at close of 1904. Property is considered valuable. Production, 1903, was 4,964,272 lbs. fine copper.

DETROIT COPPER MINING CO. OF ARIZONA.**ARIZONA.**

Office: 99 John St., New York. Mine office: Morenci, Graham Co., Ariz. Employs about 1,000 men. Organized under laws of Michigan, with capitalization \$1,000,000, shares \$25 par. James Douglas, president; Cleveland H. Dodge, vice-president; Geo. Notman, secretary and treasurer; Chas. E. Mills, general superintendent; Dr. L. D. Ricketts, consulting engineer; H. H. McLean, mine superintendent; G. E. Hunt, mill superintendent; H. S. Van Gorder, superintendent supply and mercantile department; J. B. Fleming, mechanical engineer. Mine was opened about 1880 and has become a very large producer. Lands are extensive, including the Ryerson, Arizona,

Central, Copper Mountain, Yankee, West Yankee and Montezuma mines, at and near Morenci, opened by 3 tunnels and 3 shafts, deepest workings being about 400' below the surface. Mine was originally worked open-cast, as the ore bodies are of immense size, though low in grade, averaging 3% to 4% copper with only traces of gold and silver. Ores are chiefly sulphide and highly silicious, with gangue carrying up to 40% alumina, requiring very careful handling. The concentrating ores, much the larger part of the production, are about one-half oxides and carbonates and one-half sulphides. A 240' ore bin at the Ryerson is connected with the mill by belt conveyor.

Extensive use is made of gas for power. A Loomis generator with capacity for making gas to supply 1,000 h. p. from New Mexico bituminous coal has given very satisfactory results, averaging 1-h. p. hour from 1.5 to 1.75 lbs. of coal, effecting a saving of about 30% in fuel costs. Gas power is used throughout the mine and plant, excepting only for locomotives and hoists. The power house is 64x200', of steel on concrete foundations. This is to have 1,920 h. p. eventually, using Crossley gas engines. Two 100-h. p. engines drive the blowers connected with the furnaces by a 300' pipe, a third engine of the same size being kept in reserve as an auxiliary. Two 200-h. p. engines furnish electric power, generated at a voltage of 250, stepped up to 2,500 volts at the power house and carried by 4 feed wires to a second set of transformers at the West Yankee mine, where it is stepped down to 250 volts and distributed. A new 500-h. p. engine drives the air compressor that furnishes blast at 8 lbs. pressure to the converters.

The concentrator, at Morenci, is being rebuilt in two sections, each unit to have 400 tons daily capacity. One unit is in commission and the second will be completed in 1905. The new concentrator, complete, will have a floor area of 166x240', with Chilean mills, 6 sets of 16x42" rolls, 28 revolving screens, 40 jigs and 120 tables. The ore is concentrated about 7 into 1, only 400 gallons of water being used in concentrating one ton of ore. About 1,800 gallons of water are in constant use, 125 gallons per minute of clear water being supplemented by clarified water from ingenious and highly effective settling ponds and clarifiers designed by Mr. Hunt. The supply of fresh water is pumped from wells on the San Francisco river. The concentrator was treating about 700 tons of ore daily at the close of 1904. The new crushing plant, in a separate building, will have an hourly capacity of 100 tons and will be run days only. Experiments have been conducted during 1904 with oil concentration.

The new sampling mill, above the concentrator, will take ore from the latter by a 400' belt conveyor. Both concentrator and sampler will be run throughout by electricity furnished by a plant having four 150-h. p. gas engines.

The smelter has four 54x144" blast furnaces and one mammoth new furnace 42x264" at the tuyeres. Blast is furnished by a 250-h. p. gas engine and an electric motor. About 57% of the ore is smelted as concentrates, and flue-dust is briquetted for resmelting. The smelter has an electric light plant and is thoroughly modern in equipment, 2,000-ton ore bins and a steel trestle thereto having been built in 1904.

A 36" gauge railway connects the mines and smelter with the Arizona &

New Mexico railroad at Guthrie. This line has a maximum grade of 3.5% and has 4 complete loops within an air-line distance of one and one-half miles, near Morenci. The company operates a mammoth department store and excellent hotel, and also maintains a library, gymnasium and club-room for employees. Production of refined copper was 16,456,000 lbs. in 1904. The property is managed with great skill and is an exceptionally fine example of a successful low-grade mine.

DETROIT & PARRY SOUND MINING CO., LTD.

ONTARIO.

Office: 311 Wetherbee Bldg., Detroit, Mich. W. A. Phillips, president; H. C. Morris, vice-president; E. A. Covell, secretary; D. M. Pickett, superintendent. Organized June 3, 1903, under laws of South Dakota, with capitalization \$3,000,000, shares \$1 par; unissued, \$2,509,250. Property is in the Parry Sound district of Ontario, and management gives no details as to acreage, ores or development, but it is known that some excellent assays have been secured from ores developed.

DEVON UNITED MINES SYNDICATE, LTD.

ENGLAND.

Offices: 6, Pall Mall, London, S. W., Eng. E. B. Haynes, chairman; F. N. B. Hill, secretary; G. W. Ladds, mine manager. Organized June 19, 1901, with capitalization £10,000, shares £1 par; issued, £6,000. Debentures, £5,000 authorized; £620 issued, at 6%. Lands, 100 acres, on the river Tavy, Devonshire, England, carrying tin, copper and arsenic ores. Is developing on a limited scale, the Central copper mine being pronounced one of the best copper prospects in Cornwall.

DEWEY MINE.

UTAH.

Mine office: Ibabah, Tooele Co., Utah. Is a small producer of cupriferos silver ores.

DEWEY MINE.

COLORADO.

Capitalized at \$400,000, shares \$1 par. Lands, 15 miles southeast of Saratoga, Carbon Co., Wyo. Idle at last accounts.

DEWEY CITY MINING CO.

COLORADO.

Was operating, circa 1899, near Gunnison, Gunnison Co., Colo.

DEWEY CONSOLIDATED COPPER & GOLD

IDAHO.

MINING & MILLING CO.

Letter to former office in Salt Lake City returned unclaimed. Lands were near Grangeville, Idaho county, Idaho.

DEWEY MINING CO.

IDAHO.

Letter returned unclaimed from former mine office, Bear, Washington Co., Idaho.

DEWEY & OLYMPIA GROUP.

NEW MEXICO.

Office and mine: care of U. E. McDaniel, owner and manager, Cooks, Grant Co., N. M. Ores carry gold, silver, lead, copper and zinc. Has steam power and 25-ton concentrator, employing about 20 men.

DIAMOND JOE MINE.

ARKANSAS.

Office: care of Frank Pease, Silver City, Montgomery Co., Ark. Lands show ores carrying silver, lead and copper.

DICKERSON MINING CO.

MONTANA.

Mine office: Basin, Jefferson Co., Mont. J. W. Dickerson, manager. Lands are developed by tunnel. Has steam and water power.

DILL GOLD & COPPER MINING CO.**WYOMING.**

Office: Prescott, Wis. Mine office: Rambler, Carbon Co., Wyo. Idle. W. T. Dill, president; Geo. S. Hollister, vice-president and treasurer; Ed. H. Wallace, secretary; Soren J. Sorenson, general manager. Organized July, 1903, under laws of Wyoming, with capitalization \$1,500,000, shares \$1 par. Lands, 4 patented claims, area 80 acres, lying immediately north of the Doane, in the Battle Lake district, opened by shafts of 42' and 60', and a 100' tunnel. Has steam power. Plans deepening main shaft to 300' and drifting below water-level.

DILLON CONSOLIDATED MINING & TUNNEL CO.**WYOMING.**

Mine office: Dillon, Carbon Co., Wyo. Organized 1904, to drive a 3,500' tunnel across the formation at Dillon. Tunnel is expected to cut 6 copper veins located on surface.

DINGO COPPER MINING CO.**AUSTRALIA.**

Mine office: Essington, Rockley district, N. S. W., Australia. Produced about 200 tons of high-grade hand-picked ore in 1901.

DIRIGO-LA SAL GOLD & COPPER MINING CO.**UTAH.**

Office: care of C. S. Richardson, secretary, Salt Lake City, Utah. Geo. E. McCann, manager. Lands, 31 claims, area about 600 acres, in the Deep Creek district of Utah. Worked a small force at last accounts.

DIVIDEND MINING & SMELTING CO.**NEW MEXICO.**

Mine office: Estey, Socorro Co., N. M. Organized September, 1902, with capitalization \$3,000,000. D. M. Estey, president; B. F. Coburn, vice-president and secretary; F. B. Street, treasurer. Lands, about 2,000 acres, opened by sundry prospecting shafts and tunnels showing a fair body of very rich sulphide ores carrying small gold and silver values and a little lead. Has a 100-ton concentrator and plans installing a 50-ton smelter.

DIXIE MINE.**UTAH.**

Owned by Utah & Eastern Copper Co.

DOANE MINE.**WYOMING.**

Owned by Battle Lake Tunnel Site Mining Co.

DOANE-RAMBLER MINE.**WYOMING.**

Owned by Battle Lake Tunnel Site Mining Co.

DOANE-VERDE MINING CO.**WYOMING.**

Office: 1301 Monadnock Bldg., Chicago, Ill. Mine office: Encampment, Carbon Co., Wyo. John T. Clarke, president; Frank G. Brown, assistant secretary; Robert H. Young, general manager. Organized June, 1902, under laws of Wyoming, with capitalization \$1,500,000, shares \$1 par. Lands, 7 claims, on which a little development work has been done in the hope of striking the extension of rich veins found in the Doane-Rambler.

DR. CARL PETERS' ESTATES & EXPLORATION CO., LTD.**AFRICA.**

Title changed to South East Africa, Ltd.

DOGAMARU MINES.**JAPAN.**

Mine office: Ago-mura, Ochi-gori, Iwami, Japan. B. Hori, owner; J. Stajaki, general manager. Were opened circa 1845, reopened 1873. Ore is chalcopryrite associated with argentiferous galena, sphalerite, and iron pyrites, with quartz gangue. Principal vein, of 10' to 25' width, traverses granite-porphry, with frequent faults. Have steam and electric power

and a small smelter, employing about 600 hands. Production in 1900 was 16,056 momme of silver and 551,164 lbs. of refined copper.

DOGSKIN MINE.**NEVADA.**

Mine office: Reno, Washoe Co., Nev. Has copper-gold ores.

DOLCOATH MINE, LTD.**ENGLAND.**

Offices: 20, Copthall Ave., London, E. C., Eng. Mine office: Camborne, Cornwall, Eng. F. Harvey, chairman; O. Wethered, vice-chairman; F. W. Thomas, secretary; R. A. Thomas, mine manager. Organized July 15, 1895, with capitalization £350,000, shares £1 par; £285,114 paid in. Is a large producer of tin and a small producer of copper, being the principal mine of Cornwall at present. Has a shaft nearly one-half mile deep. Paid dividends until 1902.

DOLLY B. MINE.**COLORADO.**

Mine office: Leadville, Lake Co., Colo. P. K. Connelly, manager. Ores carry gold, silver, lead and copper. Has steam and electric power and employed a considerable force at last accounts.

DOLLY HYDE MINE.**MARYLAND.**

Located in Frederick county, Maryland, and is the principal copper mine of the state, though never a large producer and long idle. Ores occur as malachite, bornite and chalcopyrite, in limestone country rock.

DOLLY VARDEN MINE.**COLORADO.**

Mine office: Sunset, Boulder Co., Colo. Garner & Ewing, owners. L. A. Ewing, manager. Ores carry gold and copper. Has steam power and employed about 10 men at last accounts.

DOLORES COPPER MINING CO.**MEXICO.**

Mine office: Matehuala, San Luis Potosi, Mex. W. B. A. Dingwall, general manager; Luciano Mureno, superintendent. Opened by tunnels and equipped with steam power. Employs about 300 men. Supposed to be held at present by Guggenheim Exploration Co.

DOMINGUEZ COPPER MINING CO.**COLORADO.**

Mine office: Delta, Delta Co., Colo. Lands are near Dominguez Cañon.

DOMINION COPPER CO.**BRITISH COLUMBIA.**

Absorbed, 1904, by Montreal & Boston Consolidated Mining & Smelting Company.

DON CARLOS & EUREKA CONSOLIDATED COPPER MINING CO.**MEXICO.**

Office: care of Sidney Witherbee, Detroit, Mich. Mine office: Nombre de Dios, Durango, Mex. Property includes the Don Carlos y Anexa, Eureka and other mines, located about 65 miles southeast of Durango. Vein is about 150' wide, and mixed, carrying small stringers and pockets of high-grade bornite, with gold and silver values, assaying 18% copper, 7 grams gold and 3 kilos silver per ton. Production, about 75 tons of ore in three years.

DON JUAN MINE.**OREGON.**

Mine office: Geiser, Ore. N. H. Thibault, owner; D. D. McLeod, superintendent. Ores carry gold and copper. Has steam power and 10-stamp mill, employing about 20 men at last accounts.

DONA LOUISA COPPER & GOLD MINING CO.**MEXICO.**

Office: 69 Wall St., New York. Mexican general office: 1A, San Francisco 7, Mexico, D. F. Mine office: Acuitzio, Michoacan, Mex. Organized 1902, under laws of Delaware, with capitalization \$1,500,000, shares \$5 par, \$2 paid in. Chas. M. Heath, president; Wm. A. Buckman, vice-president; Manuel L. Ward, secretary and treasurer; A. J. Peyton, general manager; Joseph G. Collinson, superintendent; T. Richmond Crum, engineer; Miguel Gojon, superintendent. Lands, 45 pertenencias, area 111 acres, about one mile from the Santa Emilia, in the Morelia district of Michoacan, 24 miles from nearest railroad station on the Mexican National line, showing 4 fissure veins, of which two are being developed, these having 3' average width and giving assays of 9% to 63% copper and up to 120 oz. silver and \$32 gold per ton, from oxidized ores slightly developed by shafts and tunnels. Management is apparently honorable, and veins, while narrow, are rich, but the company is following the fatal policy of paying 10% dividends while still selling stock, which naturally hurts its standing in the eyes of all conservative investors.

GEWERKSCHAFT DES BLEI- UND KUPFER-**GERMANY.****ERZBERGWERKS DOROTHEA.**

Mine office: Jannowitz, Schlesien, Germany. Herman Schönfelder, agent. Has one shaft. Presumably idle.

DOROTHY MINE.**VIRGINIA.**

Mine office: Virgilina, Halifax Co., Va. Shipped a small quantity of sulphide ore in 1900. Presumably idle.

DOS CABEZOS CONSOLIDATED MINES CO.**ARIZONA.**

Mine office: Dos Cabezos, Cochise Co., Ariz. Oscar W. Roberts, superintendent. Has auriferous and argentiferous copper ores, with steam power and a small smelter. Property considered promising.

DOUBLE STANDARD GROUP.**ARIZONA.**

Office and mines: Lochiel, Santa Cruz Co., Ariz. Frank Olsen, owner and manager. Ores carry copper, silver and lead.

DOUGLAS COPPER CO.**MEXICO.**

Office: 42 Broadway, New York, N. Y. Mine office: Cocorit, Alamos, Sonora, Mexico. Organized 1903, with capitalization \$3,000,000, shares \$5 par. Theo. Douglas, president and general manager; Melbert B. Carey, vice-president; Victor M. Tyler, treasurer; John C. Rowe, secretary; O. J. Riggs, mine superintendent. Employs about 120 men. Owns the mines and works of the Anita Copper Mines Co., S. A., and other property, including ranches and coal and timber lands. Mineralized lands are 242 acres, with total holdings of 19,760 acres, in the Baroyeca district. Mines are developed in a crush zone in a series of bedded eruptives consisting of diorite, andesite and trachyte, showing various ore bodies, width of mineralized zone averaging about 150'. Ores are cuprite, malaconite, malachite, azurite, chrysocolla, brochantite, chalcopryite, bornite, covellite and chalcocite, averaging 8.5% copper, 5.5 oz silver and \$5 gold per ton. Development is by shafts of 75', 79', 100', 150', and 600', with considerable underground openings, estimated to give 400,000 tons of ore in sight. Underground work is being pushed systematically and actively. Surface improvements

include steam hoisting plant, laboratory and assay office and necessary mine and office buildings. Company plans continuing development work and installing a reduction plant, including concentrator and smelter of 250 tons capacity, during 1905. Management is regarded as good and property is one of considerable promise.

DOUGLAS MINING & MILLING CO.

WYOMING.

Mine office: Rambler, Carbon Co., Wyo. O. G. Blaisdell, superintendent. Property adjoins the Rambler, in the Douglas Creek district. Has shown cuprite carrying good assay values in gold. Presumably idle.

DOUGLAS MINING & SMELTING CO.

NEVADA.

Office: 220 Sansome St., San Francisco, Cal. Mine office: Yerington, Lyon Co., Nev. A. B. W. Hodges, general manager. Property is the Douglas group, in the Pioche district, carrying auriferous and argentiferous copper ores, also the old Bluestone smelter. Mine is said to have a considerable amount of ore blocked out for stoping.

DOUGLAS REDUCTION WORKS.

ARIZONA.

Office 99 John St., New York. Works office: Douglas Cochise Co., Ariz. A Phelps Dodge & Co. enterprise, treating ores from the firm's mines in Cochise, Graham and Gila counties, Arizona, and the Moctezuma and Cananea districts of Sonora, Mexico. Plant is fully described in the article on Copper Queen Consolidated.

DOVER MINING CO.

COLORADO.

Mine office: Idaho Springs, Clear Creek Co., Colo. David Ellis, superintendent. Ores carry gold, silver and copper. Has steam power.

DRAGON COPPER CO.

Office: 924 Columbus Ave., Boston, Mass. Location of lands, if any, unknown.

DRAGON COPPER MINING & SMELTING CO.

ARIZONA.

Office: 310 Frost Bldg., Los Angeles, Cal. Mine office: Tombstone, Cochise Co., Ariz. Organized May, 1902, under laws of Arizona, with capitalization \$2,000,000, shares \$1 par. C. M. Renaud, president; W. Arthur Phipps, vice-president; G. H. Mosher, secretary and treasurer; Geo. M. Henry, general manager. Lands, 20 claims, area 400 acres, near the Middlemarch and opposite the Black Diamond, showing 3 contact veins between limestone and porphyry, giving assays of 16% copper, 11% lead and 14 oz. silver per ton, from azurite, malachite, bornite and chalcopyrite. Has 4 short tunnels and a 465' shaft showing high-grade ore at bottom. Has steam power and a 34-h. p. hoist, good for depth of 1,000'. Company plans sinking shaft to depth of 800' and driving an 1,800' tunnel to develop ore at depth of about 800', and also plans installing an air compressor.

DRAGON MINING CO.

ARIZONA.

Office: 261 Broadway, New York. Mine office: Johnson, Cochise Co., Ariz. Idle. Geo. M. Jacocks, president; L. M. Clifford, general manager.

DRAGON MOUNTAIN MINING CO.

ARIZONA.

Office: 533 Kearney St., San Francisco, Cal. Mine office: Pearce, Cochise Co., Ariz. Organized under laws of Arizona, with capitalization \$300,000. Lee Wee, president; Chu C. Mow, vice-president; Louis Fon, secretary; Leung Ting Mai, treasurer; W. W. Dunbar, superintendent and

agent; California Safe Deposit & Trust Co., depository. Lands are sundry claims near Middle Pass, in the Dragoon Mountains, opened by shaft and giving a promising showing of ores carrying copper, silver and gold. Company was organized by wealthy Chinese residents of San Francisco and Tombstone, Arizona, and is operating along strictly business-like and modern lines, under the management of an experienced and capable mining man.

DROGSET KOBBERVAERK.

NORWAY.

Mine office: Meldalen, Norway. Produced 2,718 tons of cupriferous pyrites in 1900.

DRUMMERS DEVELOPMENT CO.

WASHINGTON.

Office: 15 Jamison Bldg., Spokane, Wash. Mine office: Chelan, Okanogan Co., Wash. R. D. Johnson, president; Thomas Maloney, secretary. Capitalization \$100,000, shares 10c. par. Said to have a limited amount of development work with a fair showing of ore.

DUCHESS MINING, MILLING & SMELTING CO.

WYOMING.

Mine office: Holmes, Albany Co., Wyo. LeRoy Grant, general manager.

DUCKTOWN COPPER MINES.

GEORGIA.

Mine office: Pierceville, Fannin Co., Ga. Has sulphide ore, opened by shaft. Has steam power. Idle.

DUCKTOWN SULPHUR, COPPER & IRON CO., LTD.

TENNESSEE.

Offices: 1, Gresham House, Old Broad St., London, E. C., Eng. Mine office: Isabella, Polk Co., Tenn. Col. Jas. LeGeyt Daniell, chairman; C. J. Browning, secretary; Joseph Gordon Gordon, managing director; Jas. Worley, auditor; W. H. Freeland, general manager; C. W. Renark, assistant general manager. Organized Feb. 16, 1891, with capitalization, £75,000, shares £1 par, issued, £66,200, in 74,800 ordinary shares and 200 founders' of £1 each, profits being divisible on a basis of 7% plus one-half of net remaining profits to the ordinary shares, balance of profits going to the founders' shares. Debentures: £34,000 first mortgage 5%; £7,735 second mortgage 7%. Paid dividends of 7½% to 17% annually, 1897 to 1901, inclusive. Net profits in 1901 were £14,761 and net loss in 1902 was £1,218, but operations for 1903 gave a profit.

Lands include the Mary, Callowell and other mines, acquired at a cost of £68,057. Main shaft is 600' deep and ores are exclusively sulphide, averaging under 3% copper, and are without either gold or silver values. Has steam and electric power. Smelter has a Herreshoff furnace with daily capacity of about 100 tons of crude ore, with a No. 6 Connersville blower driven by a direct-connected engine. An important change in the smelting process was made in 1903, and instead of heap-roasting the ores as formerly, the pyritic system is employed, this making a 20% matte in the first fusion and a 50% matte in the second fusion, the change in smelting methods cutting down the capacity of the furnace, but effecting a considerable economy in fuel charges. The change from roasted to raw ore is said to have effected a saving of about 3 cents per pound on the refined copper production and the process, and its intelligent and highly successful application in both theory and practice, have been highly commended by metallurgists. The furnace at first lost 48% in tonnage efficiency, but this has been reduced to 16.5% net loss only. The smelter is not of entirely modern design and

probably will be remodeled. The property also has a small acid plant, and its annual production of fine copper probably is about 1,250,000 pounds.

DUGWAY COPPER MINING CO.

UTAH.

O. F. Peterson, general manager. Lands are in the Deep Creek district of Utah. Has a 100' shaft on a 15' contact vein between limestone and porphyry. Ores assay 1% to 36% copper, up to 45% lead, 17 oz. silver and \$1.60 gold per ton.

DUKE GROUP.

NORTH CAROLINA.

Mine office: Roxboro, Person Co., N. C. B. L. Duke, owner; Thos. Martin, superintendent. Lands, 470 acres. Property has 4 shafts, deepest 170'. Veins are fissures, ore having a gangue of quartz, epidote and calcite. Has good steam power equipment.

MINA LA DULCINEA.

CHILE.

Mine office. Copiapó, Atacama, Chile. Deepest shaft, 2,500'. Ores are oxides and carbonates to depth of 600', sulphides below, ores ranging 5% to 25% in copper tenor. Vein is 25' wide in places.

DULUTH COPPER CO.

SOUTH DAKOTA & ONTARIO.

Not found by postal authorities at Duluth, Minn. Has copper claims in Trill Twp., Algoma, Ont., also near Custer City, Custer Co., S. D. Was prospecting South Dakota lands with diamond drill, late in 1902. Perhaps same as Black Hills & Duluth Copper Mining Co.

DULUTH & ARIZONA COPPER MINING CO.

ARIZONA.

Office: 219 West Superior St., Duluth, Minn. Capitalization \$1,000,000, shares \$1 par. Chas. W. Ericson, president; Gideon Schelin, secretary. Lands 4 claims, south of Prescott, Yavapai county, Arizona, showing ores giving average assay values of 11% copper and \$6 gold per ton.

DULUTH & CHIRICAHUA DEVELOPMENT CO.

ARIZONA.

Office: Duluth, Minn. Mine office: Paradise, Cochise Co., Ariz. Organized 1904, under laws of Minnesota, with capitalization \$700,000, shares \$10 par. Martin Pattison, president; Edward F. Sweeney, vice-president and managing director; Geo. H. Crosby, secretary and treasurer; preceding officers, Byron M. Pattison and Thomas Bardon, directors. Property is the Sullivan and Copperopolis groups. Former, taken under bond and lease from John Sullivan, and supposed to have been bought outright by company at close of 1904, is 7 claims about 4 miles west of the Chiricahua Development Co., and is slightly developed by pits and open cuts, showing leached copper ore, and a 60' tunnel showing lead ore. Management is good and property is regarded as promising.

DUMP MINE.

COLORADO.

Mine office: Black Hawk, Gilpin Co., Colo. Walter Lampshire, superintendent. Ores carry gold, silver and copper. Has steam power.

DUNCAN GROUP.

ARIZONA.

Office: care of John A. Duncan, owner, St. Joseph, Mo. Mine office: Paradise, Cochise Co., Ariz. Lands, next south of Chiricahua Development Co. Employs 5 men in prospecting.

DUNCAN GROUP.

CALIFORNIA.

Address: care of W. C. Duncan, owner, Oroville, Cal. Mine office: Flournoys, Plumas Co., Cal. Reported values in Copper King shaft are

9% copper and \$6 gold per ton. Development work was in progress at last accounts.

DUNCAN MINING & DEVELOPMENT CO., LTD. BRITISH COLUMBIA.

Lands, claims in Cowhican Lake district, Victoria, B. C., which have given assays of 4% copper and 50% lead, with gold and silver values.

DUNKIRK GOLD & SILVER MINING CO. ARIZONA.

Office: Prescott, Ariz. Mine office: Maxton, Ariz. Edw. Kinzle, superintendent. Ores carry gold, silver, copper and lead. Has gasoline power and employs about 10 men.

DUQUESNE MINING & REDUCTION CO. ARIZONA.

Mine office: Washington, Santa Cruz Co., Ariz. J. F. Tener, agent. Ore is chalcopryite, associated with sphalerite, galena and iron pyrites, in a fissure vein between granite-porphry and limestone, opened by a 635' shaft. Has steam power and air compressor. Idle.

COMPANIA MINERA DE COBRE DE DURANGO. MEXICO.

Mine office: La Trinidad, Otaez, Durango, Mex. Wm. Dwinert, president. Operates copper property formerly owned by Cushing & Walkup.

DURANGO COPPER SYNDICATE, LTD.

Lands sold, 1900, to Avino Mines of Mexico.

DURANGO MINING CO. MEXICO.

Mine office: Yerba Buena, Durango, Mex. Capitalization \$1,000,000. Lands, 5 claims.

DURGEE MINE. VIRGINIA.

Owned by Person Consolidated Copper & Gold Mines Co.

DUTCH MILLER MINING & SMELTING CO. WASHINGTON.

Office: 202 Denny Way, Seattle, Wash. Mine office: Skykomish, Snohomish Co., Wash. H. P. Fogh, general manager. Lands show vein with maximum width of 18', carrying auriferous chalcopryite, several small smelter shipments averaging net returns of \$37.65 per ton. Opened by shaft, tunnel and open-cut, giving a fair showing of ore.

DUTTON MINE. MONTANA.

Mine office: Butte, Silver Bow Co., Mont. Patrick Wall, superintendent. Has a 350' shaft. Is a small property in East Butte, and one of the oldest in the camp. Development work was conducted actively during 1904, and near close of year a 6' vein of rich ore was cut.

DZANSULSKI WORKS. RUSSIA.

Sold to Caucasus Copper Co., Ltd.

EAGLE COPPER CO. WYOMING.

Office: 1608 Wazee St., Denver, Colo. Letters returned unclaimed from Battle and Encampment, Carbon Co., Wyo. Property is the Gertrude mine, carrying auriferous copper ores and equipped with steam power.

EAGLE COPPER MINING CO. WASHINGTON.

Mine office: Chewelah, Stevens Co., Wash. M. Mitchell, superintendent. Lands, 3 claims, south of the Wonderful group, on Stevens Peak. Has ores carrying gold, silver, lead and copper, opened by shaft and tunnel.

EAGLE COPPER-GOLD MINING CO., OF ARIZONA.**ARIZONA.**

Office: 1022 Garfield Bldg., Cleveland, Ohio. Mine office: Wickenburg, Maricopa Co., Ariz. Alex. M. Fulford, president; Benj. J. Perry, vice-president and general manager; Herbert E. Hudson, secretary and treasurer; Oscar Jennings, superintendent. Organized August, 1902, under laws of South Dakota, with capitalization \$1,000,000, shares \$1 par. Lands, 5 claims, area 95 acres, in the Blue Tank district, showing 8 ore bodies, of which the principal one has a width of 12' to 20' and gives assays of 10% copper, 10 oz. to 35 oz. silver and \$6 to \$18 gold per ton, from oxide, carbonate and sulphide ores, developed by shafts of 50' and 108'. Works 5 men.

EAGLE COPPER & GOLD MINING CO.**IDAHO.**

Office: Wallace, Idaho. Organized 1902, under laws of Idaho, by J. H. Nordquist, et al, with capitalization \$1,000,000, shares \$1 par. Lands, a short distance southeast of Mullan, Shoshone county, Idaho, have been undergoing development for several years.

EAGLE METALLIC COPPER CO.**PENNSYLVANIA.**

Letter returned unclaimed from former office, Belvidere, N. J. Organized March, 1903, under laws of New Jersey, with capitalization \$500,000. Henry D. Deshler, president; John S. Romig, treasurer; Miss Millie Deshler, secretary. Lands are in Adams county, Pa., including an old copper mine, never successful. Some development has been done by present owners, during 1903-1904.

EAGLE MINING CO.**CALIFORNIA.**

Mine office: Needles, San Bernardino Co., Cal. H. Ahrens, supt.

EAGLE & BLUE BELL MINING CO.**UTAH.**

Mine office: Tintic, Juab Co., Utah. Duncan McVichie, president and general manager; H. H. Green, secretary. The Bingham Consolidated Mining & Smelting Co. owns 190,000 of the company's 250,000 shares and property is operated as part of the Bingham Consolidated.

EAST PACIFIC MINE.**MONTANA.**

Mine office: Windsor, Broadwater Co., Mont. Robt. A. Bell, owner; F. A. Taylor, superintendent. Ores carry gold, silver and copper. Has steam power and 25-ton smelter, employing about 50 men.

EAST-SIDE GOLD MINING CO.**ARIZONA.**

Letter returned unclaimed from advertised office, Lambertville, N. J. Mine office: Bisbee, Cochise Co., Ariz. Organized under laws of South Dakota, with capitalization \$1,000,000, shares \$1 par. Chas. C. McCoy, president and general manager; E. C. Gallagher, secretary; W. A. Eckerly, assistant secretary and treasurer. Lands, 9 claims, area 168 acres, about 6 miles east of Bisbee, showing veins opened by shafts of 60' and 80', giving assays of \$8 to \$265 gold per ton, with small copper values.

EASTERN NATIONAL COPPER CO., LTD.**NOVA SCOTIA.**

Succeeded, 1904, by Cheticamp Copper Co., Ltd.

EASTERN STAR MINE.**ARIZONA.**

Letter returned unclaimed from former mine office, Williams, Coconino Co., Ariz.

J. M. ECHEVARRIA.**CHILE.**

Operates the Quilomenco mine, opened 1892, in the department of Illapel, Chile. Annual production is about 100 tons refined copper.

ECHO MINING & MILLING CO.**WYOMING.**

Mine office: Rudefeha. Carbon Co., Wyo. Lands, 4 claims, lying north of and near the Ferris-Haggarty mine of the Penn-Wyoming Copper Co.

ECLIPSE GOLD & COPPER MINING CO.**MONTANA.**

Merged, 1904, in Eclipse-Argo Mining Co.

ECLIPSE-ARGO MINING CO.**MONTANA.**

Office: Helena, Mont. Mine office: Canyon Ferry, Broadwater Co., Mont. Idle. Organized March 7, 1904, under laws of Montana, with capitalization \$300,000, shares \$1 par, as a merger of the Argo Gold & Copper Mining Co., and the Eclipse Gold & Copper Mining Co. W. F. Quade, president; M. H. Reardon, vice-president; A. W. Martin, secretary; F. L. Sizer, secretary and general manager. Lands, 4 claims, two patented, area 80 acres, in the Hell Gate district, showing a 10' fissure vein traced 2,800' in slate, carrying chalcopyrite and bornite assaying 12% copper, developed by tunnels of 300' and 1,100'. Has steam power and 40x85' log mill with 10 gravity stamps, and 1 Wilfley table. Production in 1903 was 204,570 lbs. fine copper.

ECTON MINE.**ENGLAND.**

An old and idle property in Staffordshire, England, owned by the Duke of Devonshire. Was opened in Roman times and operated as recently as 1840. Depth is about 1,500'. Was the first English mine to use gunpowder for blasting, in 1677 and the first to use wire rope for hoisting.

EDDY GOLD, SILVER & COPPER MINING CO.**ARIZONA.**

Office: P. O. Box 596, Phoenix, Ariz. Organized Aug. 22, 1902, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. F. L. Eddy, president and general manager; S. P. Donnell, secretary and treasurer. Lands, 10 claims, area 200 acres, and 5 acre millsite, in the Frog Tank Mountains, Old Baldy district of Maricopa county, Arizona. Country rocks are porphyry and gneiss, showing a 3' fissure vein in porphyry, opened by six 10' pits, shafts of 20' and 65' and tunnels of 25', 100' and 105', showing oxide and carbonate ores assaying 4.5% copper and 25% lead, with gold and silver values. Company plans resuming development work in 1905.

EDISON MINING CO.**BRITISH COLUMBIA.**

Mine office: Yreka, Vancouver Island, B. C. Lands adjoin the Yreka Copper Co., Ltd. Development work has given a promising showing of ore.

EDMUNDIAN (MANICALAND) COPPER CO., LTD.**MOZAMBIQUE.**

Liquidated voluntarily, July, 1902.

EDNA MAY MINING CO.**COLORADO.**

Letter returned unclaimed from former mine office, Winfield, Chaffee county, Colo.

EINASLEIGH EXPLORATION SYNDICATE, LTD.**AUSTRALIA.**

Offices: 20, Copthall Ave., London, E. C., Eng. W. H. Woodhead, managing director; Thos. Mullett, secretary. Organized Aug. 16, 1899,

with capitalization £4,000, shares £50 par. Lands, mineral lease No. 1,197, area 40 acres, on the Einasleigh river, Gilbert county, Queensland, Australia.
EINASLEIGH FREEHOLD COPPER MINES, LTD. **AUSTRALIA.**

Offices: 20, Copthall Ave., London, E. C., England, and A. M. P. Chambers, Edwards St., Brisbane, Queensland, Australia. Mine office: Einasleigh, Gilbert Co., Queensland, Australia. J. S. Smith-Winby, chairman; Wm. Henry Woodhead, managing director; Thos. Mullett, secretary; F. Hambridge, secretary in Brisbane; J. Adler, superintendent. Organized Apr. 17, 1899, with capitalization £200,000, shares £1 par; issued, £180,000. Lands, 120 acres, freehold, at junction of Einasleigh and Copperfield rivers, also 20 acres adjacent carrying iron ore for fluxing. Main shaft, 190'. Mine recently has been given railroad connections, lack of which hampered developments previously. Underground work has shown a promising ore body. Has a 32x75" water-jacket blast furnace and made 104 long tons copper and 1,330 oz. silver, from 1,009 tons of ore smelted in 1901. Idle at last accounts.
EINASLEIGH SOUTH BLOCKS. **AUSTRALIA.**

Mine office: Einasleigh, Gilbert Co., Queensland, Australia. Owns partially prospected mineral lands south of the Einasleigh Freehold.

EISENMANN y CARDENAS.

MEXICO.

Mine office: Huacana, Ario, Michoacan, Mexico.

EISFELDER KUPFERGEWERKSCHAFT.

GERMANY.

Mine office: Glücksbrunn, Saxe-Meiningen, Germany. Capitalization, 600,000 marks. W. A. Mertens, smelter superintendent. Was sinking two working shafts during 1904.

EL CAPITAN COPPER CO.

ARIZONA.

A worthless proposition foisted on the credulous public by Douglas, Lacey & Co. See description of Almagamated Gold & Copper Co.

EL CARMEN COPPER CO.

MEXICO.

Office: 52 Front St., New York. Mine office: El Carmen, San Juan de Heredia, Durango, Mex. Organized August, 1899, under laws of New York, with capitalization \$750,000, shares \$100 par. John W. Wilson, president; Stephen A. Levy, secretary and treasurer; Adolf Mayer, managing director. Lands, sundry mining claims, timber lands, etc., giving total landed holdings of 33,000 acres. Development has shown a considerable body of auriferous and argentiferous copper ore of concentrating grade, and company is said to have ordered a 30-stamp mill and concentrator of the Colorado Iron Works Co.

EL COBRE MINES.

CUBA.

Office: 71 Broadway, New York. Mine office: El Cobre, Santiago de Cuba. Employs 250 men. Organized Jan. 19, 1902, under laws of West Virginia, with capitalization \$5,000,000, shares \$100 par, divided into \$1,500,000 preferred and \$3,500,000 common stock. Chas. F. Rand, president and treasurer; Wm. Astor Chanler, vice-president; Wm. C. Tegethoff, secretary; Chas. F. Rand, Wm. Astor Chanler, L. H. Severance, Colgate Hoyt, James C. Colgate, E. J. Barney, E. C. Felton, Wm. Henry Yale, E. W. Oglebay and Claudio G. Mendoza, directors; Pedro Aguilera, manager; Jennings S.

Cox, Jr., consulting engineer; Morrison B. Yung, mine superintendent; Chas. H. Jones, metallurgist. Holdings of this company include the properties owned formerly by the Royal Consolidated Mines of El Cobre, Ltd., San Jose Mining Co., Santiago Copper Mining Co. and El Cobre Railroad Co. Annual meeting, first Tuesday in March.

These mines were opened by the Spanish, in 1532, and probably produced the first copper made in America, excepting the native copper taken from the Lake Superior mines by prehistoric workmen, the first product of El Cobre mines being used for casting Spanish cannon. The properties were taken over, circa 1832, by a Hispano-English company, and ore produced was shipped to Swansea for reduction. The custom-house records of Santiago are said to show exports of 610,210 tons of ore, valued at \$50,186,225 (probably in depreciated Spanish currency) from 1851 to 1869 inclusive, ores as shipped assaying from 12.69% upwards, and probably averaging about 16% in tenor. During the revolution of 1868 the big Cornish pump was burned and the mine flooded, remaining idle until bought by the present company in 1902. Property is 8 miles west of Santiago bay, on which the company has wharves, and El Cobre railway, owned by this corporation, connects the mines with the harbor and the city of Santiago. The property shows 3 wide veins, with strong outcroppings for a distance of some 6,500'. The old workings were extensive, including some 40 shafts, of which the four deepest were about 1,200' each, with 17 miles of underground openings, the mine being timbered mainly with mahogany. During the rainy season the mine makes 500 to 1,200 gallons of water per minute, this being strongly acid and requiring pumps of composition metal with lead or wood-lined pipes. The new pumps at the property have a combined capacity of 5,000 gallons per minute, and the water, as forked from the mine, is leached over scrap-iron, producing cement copper to the value of about \$5,000 monthly. The old waste-dumps contain about 250,000 tons of rejected material averaging about 2% copper. Considerable ore has been blocked out in open cuts for stoping, this averaging about 4% copper, and the tenor can be much improved by hand-sorting. A Lake Superior mining man conversant with the property estimates the company's ores as averaging about 5% in copper tenor.

A 200-ton smelter is being built at Punta Sal, on Santiago harbor, 9 miles from the mine and connected therewith by El Cobre railroad, 9 miles in length, with termini at Punta Sal and the mine. This railroad, owned by the company, has 2 locomotives and 40 cars. Fuel used at the mine is bituminous coal costing \$4.35 per ton, and the smelter will use coke costing \$6.50 per ton.

El Cobre mines are of undoubted value. The present owners, who are officials and shareholders of the Juragua Iron Co., Ltd., and the Cuban Steel Ore Co., having extensive iron mines in the Sigua and Juragua districts, not far from El Cobre mines, are financially strong, and are conservative in their operations, which are along legitimate lines. Upwards of \$500,000 in cash has been expended in reopening and equipping the property, which doubtless will return good profits in time.

EL COBRE MINING CO.**MEXICO.**

Office: care of Joseph D. Whitham, president and treasurer, Denver, Colo. A. S. Mackenzie, vice-president and general manager; Guy C. Clemens, secretary. Organized under laws of District of Columbia, with capitalization \$5,000,000, shares \$1 par. Lands, about 1,000 acres, including La Gran Duquesa and Transvaal mines, also a smelter site, in the Ures district, about 60 miles east of Hermosillo, Sonora, Mexico, to which point there is a good wagon road. Ores are claimed to have given average smelter returns of 20.1% copper, 1.75 oz. silver and \$4 gold per ton. The company's fiscal agent puts out statements in his advertising that it would greatly trouble him to substantiate.

EL DIAZ GOLD & COPPER CO.**MEXICO.**

Office: 332 Drexel Bldg., Philadelphia, Pa. Mine office: San Martin Hidalgo, Jalisco, Mex. Organized 1901, under laws of New Jersey with capitalization \$1,600,000, shares \$1 par. Daniel Lamont, Jr., president and trustee; Aubrey F. Lee, secretary; J. R. Williams, manager. Lands, 60 pertenencias, area about 410 acres, including 12 old workings, in the Rancho de Papinto district of Jalisco. Mine is opened by tunnels and shafts. Equipment includes 10-stamp mill, 25-ton chlorination plant and 80-ton smelter. Employed about 125 men at last accounts.

EL DORADO COPPER MINING CO.**CALIFORNIA.**

Office: 517 Parrott Bldg., San Francisco, Cal. Mine office: Georgetown, El Dorado Co., Cal. Organized 1902, under laws of Colorado, with capitalization \$2,000,000, shares \$1 par. A. V. Green, president; W. E. Everson, superintendent. Lands, 17 quartz claims and 4 placer claims, area circa 400 acres, mostly patented, including properties carrying gold, copper and asbestos, including sundry gold mines and the Ford mine, carrying auriferous copper ore and asbestos. The Ford mine shows a 10' to 12' vein with 8" to 12" paystreak, opened by 3 shafts, deepest 100' and a 200' tunnel. Is sinking a new 3-compartment shaft on the Eureka-Woodside gold property. Company said to be composed of men of good standing but the company's prospectus contains a vast amount of varied misinformation.

EL PROGRESO COPPER MINING CO.**MEXICO.**

Office: 67 Wall St., New York. Mine office: Ayutla, Jalisco, Mexico. Organized under laws of South Dakota, with capitalization \$1,500,000, shares \$1 par. David B. Russell, president and general manager, Guadalajara, Mex.; James H. Hornby, secretary. Lands, about 80 acres, including "antiguas" supposed to have been worked by Aztecs and Spaniards, showing ores claimed to carry 12% copper, a trace of gold and 12 oz. silver, per ton. Company made unreasonable promises of dividend returns when organized, and apparently is on the high-road to ruin, through dissensions and lawsuits.

EL REY GOLD & COPPER MINING CO.**WYOMING.**

Office and mine: Encampment, Carbon Co., Wyo. W. C. Henry, manager.

EL TRIUMFO CONSOLIDATED MINING CO.**MEXICO.**

Mine office: Bacoachi, Sonora, Mex. B. Granville, managing director;

A. C. Charlot, general manager. Lands, 165 acres, on which development has shown several promising ore bodies.

EL VERDE GRANDE COPPER CO.**MEXICO.**

Office: care of Percy Sharpe, Nogales, Ariz. Mine office: Imuris, Magdalena, Sonora, Mex. Capitalization \$2,000,000, shares \$1 par. Lands are in the foothills of the Sierra Azul, 14 miles from Imuris, which is on the Sonora railroad.

ELDORA ENTERPRISE GOLD MINING CO.**COLORADO.**

Mine office: Eldora, Gilpin Co., Colo. Chas. W. Sheehan, superintendent. Ores carry gold, silver and copper. Has steam power and 10-ton smelter.

ELDORADO GOLD MINING & MILLING CO.**UTAH.**

Office: 549 25th St., Ogden, Utah. Mine office: Hot Springs, Box Elder Co., Utah. Don Maguire, manager. Ores carry silver, lead and copper. Company plans installation of a small concentrating and smelting plant. Employs about 20 men.

ELECTRA MINING & MILLING CO.**ARIZONA.**

Office: care of Alfred Day, P. O. Box 513, Steubenville, Ohio. Lands, somewhere in Arizona, are said to show ore giving average assays of \$27 per ton.

ELECTRIC IRON & STEEL CO.**CALIFORNIA.**

A deliberate fraud, perpetrated by W. C. Brunson and J. W. Turner, who claimed to own 7,000 acres of rich mining land in Shasta county, California.

ELECTROLYTIC COPPER MINING & SMELTING CO.**OREGON.**

Letter returned unclaimed from former mine office, Imnaha, Wallowa Co., Ore.

ELIDORO VALENCIA.**PERU.**

Mine office: Quichin, Camaña, Peru. Is a small copper producer.

ELITE GOLD & COPPER MINING CO.**WASHINGTON.**

Office: care of C. K. Humphries, Globe Bldg., Seattle, Wash. Mine office: Index, Snohomish Co., Wash. Capitalization, \$1,000,000. F. R. Thompson, president; J. F. Douglas, secretary. Said by party selling company's stock to have a 9' ore body giving assays of 20% copper and \$133 gold, per ton.

KUPFERERZBERGWERK ELIZA.**GERMANY.**

Mine office: Mallau, Elsass-Lothringen, Germany. Supposed to be owned by London parties. Apparently idle.

ELIZABETH MINING CO.**VERMONT.**

Office: 301 North Charles St., Baltimore, Md. Mine office: South Strafford, Orange Co., Vt. Wm. Glenn, president; Jas. W. Tyson, Jr., secretary and superintendent. Was opened 1793, the magnetic pyrites being used for making copperas. Eventually it was found that the mine carried an average of about 3% copper in the form of chalcopyrite disseminated in pyrrhotite, and the Elizabeth became the largest American copper producer, previous to the opening of the rich mines of Lake Superior. Ore bodies occur as lenses in foliated micaceous schists, the lenses overlapping, and wedging

out at the bottom. Main ore body at the Elizabeth has been mined for 700' in length and at one point was 100' wide. Company plans magnetic concentration upon a large scale. Property has good steam power plant and a small smelter.

ELK MOUNTAIN MINING & MILLING CO.

WYOMING.

Office and mine: Encampment, Carbon Co., Wyo. T. R. Smith, president; S. E. Phelps, secretary and treasurer; B. A. Kaylor, superintendent. Organized 1900, under laws of Wyoming, with capitalization \$1,000,000, shares \$1 par. Lands, 660 acres, patented, in the Upper Platte district, showing three 5' ore bodies in limestone, giving assays of 15% copper and \$3 gold per ton, from chalcocite, bornite and chalcopryite. Has 3 shafts, deepest 183' and an 85' tunnel, with steam and electric power. Property considered promising.

ELLA COPPER MINING & DEVELOPMENT CO.

CALIFORNIA.

Office: San Jose, Cal. Lands, near the New Almaden cinnabar mine, are claimed to show a 40' vein of 10% copper ore, which report undoubtedly is due to defective vision on the part of the party so reporting. Such ore bodies are not allowed to remain unworked.

ELM RIVER COPPER CO.

MICHIGAN.

Office: 60 State St., Boston, Mass. Mine office: Winona, Houghton Co., Mich. Organized April 20, 1899, under laws of New Jersey, with capitalization \$1,200,000, shares \$12 par, fully paid. Annual meeting, third Wednesday in April, at Jersey City, N. J. On Jan. 1, 1903, had a balance of assets \$282,653.91. H. F. Fay, president; Geo. G. Endicott, secretary and treasurer; Jas. Chynoweth, superintendent; H. F. Fay, John C. Watson, Stephen R. Dow, G. G. Endicott and Chas. N. King, directors; A. D. Nicholas, purchasing agent. Lands, 2,300 acres, in Section 6, Town 52 North, Range 35 West, Sections 1, 2, 11 and 12, Town 52 North, Range 36 West and Section 36, Town 53 North, Range 36 West, also a millsite in Section 30, Town 54 North, Range 36 West, on the shore of Lake Superior.

Has secured nearly a complete cross section of its lands by 5,000' of diamond drill borings, and has sunk, crosscut and drifted on several different cupriferous amygdaloids at a variety of points. Shafts 1 and 2, latter 200' deep, are on the Winona lode; No. 3 shaft, 100' deep, and No. 4, 50' deep, are on the Shawmut lode, and 5 is on an unidentified lode located by diamond drill. Work on No. 5 was discontinued July, 1903, at depth of 250'. No. 1, the first shaft started by the company, was abandoned at depth of 100', but was reopened in 1903, owing to the improved showing secured at the Winona. Shaft is 9x14' in size and is about 500' in depth, sunk in the foot-wall of the Winona amygdaloid at an angle of 72°. Having cut good ground drifts were started on the 500' level late in 1903, and various drifts and crosscuts were run from the 500' level in 1904, a 35' amygdaloid carrying a little copper being found in November, 1904. Shaft has a duplex hoist, good for 1,000' depth, also 2 Burt marine boilers and a 4-drill air compressor. Water is pumped from a dam by a Blake pump. Property has a 40x40' machine shop and smithy 40x40', carpenter shop, 28x65', two-story ware-

house, boarding-house with accommodations for 100 men, a schoolhouse and a number of dwellings.

ELSIE MINING CO.**COLORADO.**

Mine office: Winfield, Chaffee Co., Colo. L. J. Reed, superintendent. Ores carrying gold, silver and copper are developed by tunnel.

ELSIE ADAIR COPPER MINING CO.**AUSTRALIA.**

Office: Port Augusta, South Australia. A. M. Hardy, manager. Has steam power and employed about 40 men at last accounts.

ELY MINE.**VERMONT.**

Now known as the Copperfield Mines.

ELY MINING & MILLING CO.**NEVADA.**

Office: care of Maj. H. P. Myton, president, Salt Lake City, Utah. Mine office: Ely, White Pine Co., Nev. J. W. Langley, secretary. Organized 1904, under laws of Utah, to operate mines at Ely.

EMERALD MINING & SMELTING CO.**MEXICO.**

Mine office: Santa Catarina del Norte, Baja California, Mex. W. R. Ramsdell, superintendent. Operates La Esmerelda copper mine, opened by shafts. Employs about 75 men.

EMMA MINE.**MONTANA.**

At Butte, Silver Bow Co., Mont. Was owned by Butte Mining & Development Co., which "went broke" on the property after sinking an 800' shaft and finding a 300' vein at bottom, carrying about 2% copper only.

SOCIEDAD MINERA EMMA LUISA.**CHILE.**

Mine office: Taltal, Antofagasta, Chile. J. S. Marion, superintendent. Has auriferous copper ores, with steam power, and employs about 25 men.

GEWERKSCHAFT EMMANUEL.**GERMANY.**

Mine office: Wülfrath, Rheinprovinz, Germany. Has a single shaft, developing zinc and copper ores.

EMMONS MINE.**NORTH CAROLINA.**

Owned by Hercules Gold & Copper Co.

EMPIRE MINE.**ARIZONA.**

Mine office: Lochiel, Santa Cruz Co., Ariz. Stephen O'Connor, owner. Ores carry copper, silver and lead.

EMPIRE COPPER CO.**NEVADA.**

Lands, near Reno, Washoe county, Nevada, were transferred to Pacific Consolidated Mining Co. Empire company probably dead.

EMPIRE MINES CO.**NEW MEXICO.**

Mine office: Hanover, Donna Ana Co., N. M. J. W. Bible, superintendent. Property is the Ivanhoe mine, having considerable development on a promising ore body. Has steam power and 100-ton concentrator. Idle at last accounts.

EMPIRE MINING CO.**MICHIGAN.**

Office: care of W. K. Prudden, Lansing, Mich. Reincorporated, 1899, for 30 years. Lands, 2,100 acres, near Mosquito Lake, Keweenaw county, Michigan. Never a producer, and idle many years.

EMPIRE SMELTING CO.**ARIZONA.**

Office: care of Franklin Bowring, secretary, San Francisco, Cal. Works office: Benson, Cochise Co., Ariz. Riley G. Boggess, president; Peter Kirk, treasurer and manager; F. B. Clark, superintendent. Plant has a 75-ton Kirk furnace burning crude petroleum, and company has ordered a 200-ton water-jacket blast furnace. Works are favorably located for the receipt and smelting of custom ores.

EMPIRE STATE MINING CO.**ARIZONA.**

Office: care of H. B. Coon, Utica, N. Y. Mine office: Bisbee, Cochise Co., Ariz. Organized June 27, 1904, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. W. L. Scott, president; A. W. Daggett, treasurer.

EMPIRE TUNNEL & GOLD MINING, MILLING & TRANSPORTATION CO.**COLORADO.**

Office: Georgetown, Colo. Mine offices: Empire, Clear Creek Co., Colo., and Leadville, Lake Co., Colo. Frank A. Maxwell, president and manager; Clarence Jarbeau, secretary; Daniel Wall, superintendent at Empire; W. S. Jones, superintendent at Leadville. Property includes the Empire Tunnel and Gold mines at Empire and the Cloud City mine at Leadville, carrying gold, silver, lead and copper ores, latter as sulphides. Water power at Empire, steam power at Leadville. Plant includes a 50-ton concentrator, and company plans building a 200-ton smelter at Denver. Average force employed is about 50 men. Seems a valuable and well-managed property.

EMPIRE-GOLD BUG MINING CO.**COLORADO.**

Mine office: Empire, Clear Creek Co., Colo. W. P. Clough, superintendent. Has cupriferous gold and silver ores, slightly developed.

EMPIRE & STAR MINING, MILLING & SMELTING CO.**WYOMING.**

Mine office: Hecla, Laramie Co., Wyo. Henry S. Schwartz, superintendent. Ores carry gold, silver and copper. Has steam power, 15-stamp mill and leaching plant.

ENCAMPMENT MINES CO.**WYOMING.**

Mine office: Encampment, Carbon Co., Wyo. B. E. Burger, supt.

ENCINILLAS MINES, LTD.**MEXICO.**

Offices: Billiter Bldgs., Billiter St., London, E. C., Eng. Works office: Santa Rosalia, Chihuahua, Mex. Registered Nov. 11, 1902, with capitalization £100,000, shares £1 par, to take over mining property from the Anglo-Mexican Syndicate, Ltd. Joseph Constantine, chairman; G. O. Greenwell, secretary; Paul Ginther, managing director. Lands, 80 acres, including the Dolores y Anexas mines, in the Encinillas mountains, about 60 miles from Santa Rosalia, carrying ores of copper, gold, silver and lead. Has steam and electric power and a smelter with 50-ton Allis-Chalmers copper matting furnace and 50-ton lead furnace, and foundations have been laid for a 200-ton copper furnace. Traction engines transport the ore from mines to the smelter, at Santa Rosalia, which was blown in Jan. 1, 1904.

ENCINITO COPPER CO.**CALIFORNIA.**

Mine office: Encenitas, San Diego Co., Cal. Supposed to have a concentrator.

ENGELS COPPER MINING CO.**CALIFORNIA.**

Office: 421 Market St., San Francisco, Cal. Mine office: Taylorville, Plumas Co., Cal. Has sulphide, carbonate and silicate ores giving good assay values in copper, gold and silver, partly developed.

ENGLISH & AUSTRALIAN COPPER CO., LTD.**AUSTRALIA.**

Offices: 142, Palmerston House, London, E. C., Eng. Local offices: Newcastle, N. S. W., Australia, and Port Adelaide, South Australia. John Harvey, chairman; Wm. Owen Robinson, deputy chairman; W. R. Caldwell Moore, secretary; F. S. Chany, mine manager. Organized 1851. Present capitalization, reduced from £350,000 to £105,000, shares 30s. par. Debentures, £35,000 at 6%, due 1907. Paid dividends of 54%, 1871-1883. Last dividend, 1s. in 1902. Property includes an interest of 3,904, shares in the New Clara St. Dora Mining Co., and smelting works at Newcastle and Port Adelaide. These plants are large and well equipped, employing several hundred men each.

ENTERPRISE MILL & MINING CO.**COLORADO.**

Mine office: Eldora, Gilpin Co., Colo. J. T. Mitchell, manager. Has cupriferous gold and silver ores, with steam power, concentrator and 50-ton chlorination plant, employing about 25 men.

EQUATOR MINING & SMELTING CO.**ARIZONA.**

Office: 49 Wall St., New York. Mine office: Jerome, Yavapai Co., Ariz. J. A. McDonald, president. Senator W. A. Clark is the principal shareholder. Lands are on Equator Hill in the Agua Fria district, south of Jerome about 4 miles by trail, or 6 miles by wagon-road. Property is commonly called the Iron King mine, but should not be confused with the Iron King mine of the American Copper Co. Lands show a mineralized zone, ranging up to 600' in width and traceable for upwards of 1,000 in a north and south direction. It was feared that the ore body was a blanket vein, but diamond drill borings show that it holds to depth and gives auriferous and argenterous copper ores of good value. Mine is developed by a 300' main shaft, and equipped with a substantial machinery plant. Has a 250-ton smelter, with a 5,000' gravity tram-line to the upper tunnel on the Iron King claim. Management is of the best, and property considered promising. The smelter has been in blast, with occasional interruptions since June, 1904, and production for year is estimated at 1,200,000 lbs. refined copper.

ERIE CONSOLIDATED MINING & REDUCTION CO.

Name changed to this title from Wahnita Copper Co. Both fraudulent.

ERIE COPPER MINING CO.**UTAH.**

Office: 4 Atlas Blk., Salt Lake City, Utah. Mine office: Milford, Beaver Co., Utah. Organized 1902, under laws of Utah, with capitalization \$1,500,000, shares \$1 par. C. E. Albrook, president; Frank C. Morehouse, vice-president and superintendent; L. G. Brown, secretary and general manager. Lands, 15 claims, in the Beaver Lake district, showing fissure veins in granite, developed by a 312' two-compartment shaft showing oxidized ores at and near surface, with low-grade sulphides carrying occasional

native copper in the lower workings. Has gasoline power. Vein is considered an extension of the O. K. of the Majestic mine.

ERIE-ONTARIO DEVELOPMENT CO.

MICHIGAN.

Office: care of H. F. Fay, 60 State St., Boston, Mass. Jas. Chynoweth, superintendent. Will be organized, 1905, with capitalization \$50,000, shares \$5 par, upon a plan somewhat similar to that followed by the Michigan-Arizona development companies that have met with such marked success in the Warren district of Arizona. The plan of organizing a preliminary development company, while new in Lake Superior mining finance, has many advantages, chief of which is the comparatively small capital required for preliminary exploratory work, which means that only that amount will be sunk if developments do not prove satisfactory.

Lands, 640 acres, including the old Erie and Ontario mines, in Sections 29, 30, 31 and 32, Town 53 North, Range 35 West, 7 miles south of the Champion and just midway between the Champion and Winona mines. The tract shows a copper-bearing lode, apparently the southerly continuation of the Baltic amygdaloid. The Erie and Ontario were worked in a small way, under great difficulties, circa 1855-1858, the only communication with the balance of the district being by a 10-mile wagon road to Misery Bay, thence from that miserable harbor by water. Work was by shallow pits, from which some mass and barrel copper was taken. The new company is planned to begin systematic development work by trenching and test-pitting, early in 1905. The property is regarded as one having great possibilities.

ERIEGA COPPER & COAL MINING & SMELTING CO.

MONTANA.

Office: Butte, Silver Bow Co., Mont. Idle. Organized 1901, under laws of Montana, with capitalization \$1,000,000. John F. Firch, president; Chas. Anceny, vice-president; Andrew Lowinsky, superintendent. Lands, 9 patented claims, area 185 acres, also 960 acres of coal lands, a 20-acre millsite and a 20-acre smelter-site, in the Bozeman district of Gallatin county, Montana, showing 2 fissure veins averaging 30' width and giving estimated average values of 7% copper, 30 oz. silver and \$10 gold per ton, mainly from sulphide ores, with occasional carbonates and native copper. Has shafts of 25', 40' and 80' and tunnels of 60' and 300' length, with steam power. Property apparently is of promise, but the officers of the company have poor standing and company is out of both cash and credit.

COMPAÑIA MINERA ESCUADRA, S. A.

MEXICO.

Mine office: Ocotlán, Oaxaca, Mex. W. J. Carter, manager; E. G. Hart, superintendent. Ores carry gold, silver and copper. Mine is opened by tunnels and equipped with steam power, employing about 200 men.

ESCURIAL COPPER MINES, LTD.

SPAIN.

Offices: 4, Union Court, London, E. C., Eng., and Pelayo 2, Barcelona, Spain. Mine office: Calmenarijos, Madrid, Spain. Jas. Taylor, chairman; Joaquin Llorena, mine manager; H. Gardiner, secretary. Organized Oct. 17, 1901, with capitalization £125,000, shares £1 par; issued, £109,277. Lands, 342 acres, including Nuestra Senora del Pilar, Gloria and Jaime mines. Work is confined to the former which shows 8 ore bodies. This mine was

worked by the ancients, either Romans or those who preceded them, to a depth of 135', by 3 shafts with sundry drifts. Sundry small shipments of selected ore give returns of 7.73% to 20.36% copper. Company is developing on a small scale, but steadily, and property is considered promising.

ESMERELDA MINE.

MEXICO.

A company by this name, organized by W. R. Ramsdell, et al, began mining in 1900 in Baja California, Mexico, doing considerable development and shipping some ore, but veins pinched and grew low-grade, copper dropped in price and work was suspended, circa 1902.

MINA ESMERELDA.

MEXICO.

Mine office: Cos, Sonora, Mex. Chas. Scott, superintendent. Property carries gold and copper, and was being developed by Oregon parties at last accounts.

MINAS LA ESMERELDA y ANEXAS.

MEXICO.

Mine office: Chalchihuites, Zacatecas, Mexico. Leopoldo Viadero, manager. Ores carry gold, silver, lead and copper. Mine is opened by shafts and tunnels, and employs about 150 men.

ESNA DEVELOPMENT SYNDICATE, LTD.

NORWAY.

Organized, 1896, to take over a Norwegian mine, since abandoned.

SOCIEDAD MINERA DEL NORTE DE ESPAÑA.

SPAIN.

Mine office: Herrera de Rio Pisuerga, Palencia, Spain. Don Federico Villanueva, president. Organized 1902. Lands include various concessions carrying coal, iron and copper.

SOCIEDAD ESPAÑOLA DE FUNDICION.

CHILE.

Operates Los Angeles mine, in the department of La Ligua, Chile, and is said to make matte equivalent to about 650,000 lbs. refined copper yearly.

ESPERANZA GROUP.

SPAIN.

About 8 miles west of the Rio Tinto mine, in the province of Huelva, Spain. Is being developed by an English company and should become a producer in 1905 or 1906, to the extent of about 1,000 tons of fine copper annually.

COMPANIA MINERA ESPERANZA y CONSTANCIA.

MEXICO.

Mine office: Sierra Mojada, Coahuila, Mex. Miguel Bernardino, manager. Operates La Fortuna mine, opened by a 350' shaft, equipped with steam power and producing silver, lead and copper. Employs about 250 men.

ESPERANZA MINING CO.

MEXICO.

Office: Land. Title Bldg., Philadelphia, Pa. Mine office: Cedros Island, Baja California, Mex. W. R. Nicholson, president; Edger W. Nicholson, secretary; Geo. P. Brown, general manager. Lands include a considerable part of Cedros Island, and considerable development has been secured and several thousand tons of medium and high-grade ore were shipped by water to United States smelters during 1904. Management of company considered good and property of more than usual promise.

MINAS ESPERANZA y VISITACION.

SPAIN.

Mine office: Albarracin, Teruel, Spain. Don Santiago Maorad, pro-

prietor. Are iron mines in which a promising lense of copper ore was discovered in 1903.

ESPIE BAY MINES DEVELOPMENT

TURKEY IN ASIA.

SYNDICATE, LTD.

Offices: 34, Old Broad St., London, E. C., Eng. J. E. Davidson, chairman; W. F. S. Armstrong, secretary. Capital, nominal, £30,000; issued, 25,007 shares, 10s. called up. Property, old copper mines on Espie Bay, near Tereboli, Trebizond villayet, Asia Minor. Company began reopening old mines in 1901, but presumably has ceased operations, as no recent advices of work have been received.

JOSÉ R. ESPINOZA.

CHILE.

Operates Las Palmas mine, opened 1880, making 100 to 150 tons copper yearly, also the Cantarito mine, opened 1898, making 50 tons of copper annually, both in department of Petorca, Chile.

ALEXANDER ESQUER y CA.

MEXICO.

Mine office: Baroyeca, Sonora, Mex. J. J. Esquer, manager. Operate the Mexicana, Esperanza and other mines, having ores carrying copper, gold and silver, opened by shafts and tunnels. Employ about 25 men.

MINA ESTACA.

CHILE.

Mine office: Chañaral, Atacama, Chile. Cruz Hermanos, owners; R. Cruz, manager. Has steam power and employs about 40 men.

ESTERBROOK MINING CO.

WYOMING.

Office and mine: Douglas, Albany Co., Wyo. Geo. W. Metcalf, president; John Foxton, secretary and treasurer. Organized 1897, under laws of Wyoming, with capitalization \$10,000; reorganized Sept. 9, 1903, with capitalization \$1,000,000; unissued, \$510,000. Lands, 120 acres, also 120 acres miscellaneous lands, showing a 4' fissure vein in country rocks of diorite, schist and granite, giving assays of 2% to 4% copper, 25% to 30% lead, 2 oz. to 4 oz. silver and \$1 to \$2 gold per ton, from cerussite, galena, chalcopyrite, cuprite and native copper. Has 2 short tunnels and 5 shafts, deepest 150'. Company plans improving an available water power and constructing a 100-ton concentrator.

ESTEY MINING & MILLING CO.

NEW MEXICO.

Mine office: Estey, N. M. D. M. Estey, general manager. Has auriferous and argentiferous copper ores, with steam power and small smelter, employing 75 to 100 men at last accounts.

COMPAGNIE LA ESTRELLA.

SPAIN.

Office: Blvd. Hausmann, 16, Paris, France. Lands, sundry copper properties in province of Almeria, Spain.

NUEVA SOCIEDAD PROPIETARIA LA ESTRELLA.

SPAIN.

Office: Granada, Spain. Has opened La Jerezana mine, in province of Granada, Spain.

ETHEL CONSOLIDATED MINES CO.

WASHINGTON.

Office and mine: Index, Snohomish Co., Wash. Succeeded Ethel Copper Mining Co. and John D. Copper Co., also absorbed the Mother Lode group. Organized 1902, with capitalization 3,500,000 shares, par value

unknown. G. A. Pounder, president and general manager, at last accounts, but new management from New Castle, Pa., said to be in control. Lands, 37 contiguous claims, giving 21,000' on the strike of the vein. Principal development is on the Ethel group. Power is furnished by a Pelton water wheel. Has a sawmill, 75-ton concentrator, with crusher rolls and Huntington mill, 4,000' from mine and connected therewith by a gravity tram equipped with automatic steel ore-cars. Mine is developed by tunnels and has nearly a quarter-mile of underground openings. Ores are chalcopyrite, bornite, and chalcocite, mainly bornite at depth, with quartz gangue, said to average 4% copper, with small gold and silver values. Mine begun shipments in summer of 1902 and started payment of monthly dividends of 1% in 1903, but stopped dividends shortly, and the mine a little less shortly. Reason given for closing mine was that concentrator was not adapted to treating the Ethel ores, which was true, as the ores slime badly, but a further reason, not given by the management, was a scarcity of developed ore. Property shows a considerable body of low-grade ore, and if given a good management, ample capital and time, may make a mine.

ETHEL COPPER MINING CO.

WASHINGTON.

Succeeded by Ethel Consolidated Mines Company.

ETHEL GOLD MINING CO.

COLORADO.

Mine office: Turret, Chaffee Co., Colo. A. A. McKenzie, superintendent. Ores carry gold, silver and copper. Has steam power.

ETNA MINING CO.

COLORADO.

Mine office: Georgetown, Clear Creek Co., Colo. W. D. Hoover, manager. Opened by tunnel. Ores carry gold, silver, lead and copper.

ETRUSCAN COPPER ESTATES, LTD.

ITALY.

Offices: 139, Queen Victoria St., London, E. C., Eng. Mine office: Campiglia, Maritima, Tuscany, Italy. Vavasour Earle, chairman; E. Govett, resident director; Henry Pope, secretary. Lands, 2,000 acres freehold including the old Lanzi, Temporino and Rombola mines, also mineral rights to about 1,000 acres of adjoining lands. Capital, £575,000, fully paid Debentures; £200,000 first-mortgage at 6%. The property shows many and extensive old workings, certainly as old as the Roman and probably dating back in their inception to Etruscan times. During the Nineteenth Century various Italian, French and English parties attempted successively but unsuccessfully to reopen these old mines, which are honeycombed by ancient inclines, adits, drifts, winzes and stopes. The properties were examined by C. Algernon Moreing, Edgar P. Rathbone, R. J. Frecheville, Alexander Hill and J. H. Fawcett. The three first named, who are eminent engineers of the highest professional standing, reported unfavorably. Mr. Moreing stated that "the fact is, that poor as the showing is at the lead and blende mines, it is the only place where ore can be seen at all." Mr. Moreing later stated that the official statements of the company to the shareholders referring to colossal ore deposits are absolutely incorrect, and that there are no such deposits in existence. For these statements the company sued Bewick, Moreing & Co., but dropped the suit for reasons

best known to the management. Mr. Rathbone said, "I do not consider that it would be possible to adopt any systematic method of mining which would pay expenses." Mr. Hill, also an eminent engineer, says that the mine might "possibly" pay with proper development. Mr. Fawcett thought enough of the showing to accept the management of the mine, but had the good sense to resign later. The company claims to have 4 cupriferous veins, ranging 60' to 120' in width, nearly parallel and traceable $1\frac{1}{2}$ miles. Consensus of the best professional opinion is to the effect that the ore bodies, while undoubtedly extensive, are pockety and uncertain, and it is apparent that the principal values were removed by the ancients.

Development by the present company has been carried on at various points. The Walter vertical shaft of 75 metres depth at the Cava del Piombo mine has opened several levels stated to show a vein of 20x15 metres, in a section on the third level. This shaft has a 13-metre head-gear with two-cylinder hoist and three boilers. The Grand Cava shaft shows extensive old workings, as, for that matter, do practically all of the new openings. Operations have been suspended on the West vein. The Govett shaft of 100 metres depth shows extensive old workings and little else. The Earle shaft, formerly the Coquand, 90 metres in depth, also shows many old workings. Le Marchant shaft, of 30 metres depth, with an 18-metre drift, shows heavy iron pyrites and a little chalcopyrite with amphibole gangue. While the property is called a copper mine, it seems to be the practically unanimous opinion of experienced engineers, not connected with the company, that the principal values, doubtful as those may be, are in lead and zinc, rather than in copper. The reduction plant, with concentrating machinery and smelter rated in about 240 tons daily capacity, has a 100-ton copper furnace, expected to treat about 400 tons weekly of 4% to 5% copper ore. The concentrator was started working on zinc-lead ores about August, 1903. The mines at Temporino and Lanzi are connected by rail with the smelter at Rombola.

An immense amount of money has been sunk by this company, under the management and dictation of the chairman, a pig-headed Briton, who made a success of the manufacture of cement, which success so unduly inflated his self-esteem that he disregarded the advice of eminent mining engineers and fatuously lavished enormous sums upon this apparently hopeless enterprise. The only thing that can be said for Earle is that he spent his own money as well as the cash of others, hence he is entitled to be called honest, even though lacking in the rudiments of good mining judgment. There seems no hope that the Etruscan Copper Estates can make a success, and its final appearance in the bankruptcy courts may be anticipated.

EUREKA GROUP.

CALIFORNIA.

Office: care of H. F. Dimock, Carrville, Cal. Lands, 2 claims, in Secs. 17 and 18, T. 37 N., R. 7 W., Trinity Co., Cal. Ore is silicious and low grade. Has a 50' tunnel.

EUREKA MINE.**HONDURAS.**

A property in the Orica Basin, department of Tegucigalpa, Honduras, which produces gold, silver and copper, the latter in small quantities, as a by-product.

EUREKA MINE.**VERMONT.**

Mine office: Corinth, Orange Co., Vt. E. L. Smith, general manager. Property includes the Eureka and Union, sometimes known as the Pike Hill mines. Was developing with 15 men at last accounts.

EUREKA CONSOLIDATED MINING CO.**MEXICO.**

Mine office: Nombre de Dios, Durango, Mex. Ore from surface assayed 2% copper and about 1 kilo silver per ton.

EUREKA COPPER CO.**ARIZONA.**

Letters returned unclaimed from former office, 48 Wall St., New York. Lands, sundry claims, 8 miles west of Globe, Gila Co., Ariz., showing a considerable body of low-grade ore.

EUREKA COPPER MINING CO.**WYOMING.**

Mine office: Encampment, Carbon Co., Wyo. H. A. Frambach, president; W. C. Henry, vice-president; O. B. Thompson, secretary; Bernard McCaffrey, treasurer. Lands, 5 claims, area 103 acres, 3 miles southwest of Encampment, opened by 140' shaft. Made some small shipments in 1903.

EUREKA DEVELOPMENT CO.**ARIZONA.**

Office: Calumet, Mich. Mine office: Tucson, Pima Co., Ariz. H. T. Allen, superintendent. Presumably idle.

EUREKA EXPLORATION CO.**COLORADO.**

Office: Sioux City, Iowa. Mine office: Eureka, San Juan Co., Colo. J. H. Moreland, superintendent. Ores carry gold, silver, lead and copper. Has steam and water power, with 50-ton concentrator. Employs about 30 men.

EUREKA GOLD & COPPER MINING CO.**ARIZONA.**

Mine office: Jerome, Yavapai Co., Ariz. C. W. Woods, president; H. M. Gibbs, secretary and treasurer; Harry Gilmore, superintendent. Lands, 8 claims, 7 miles south of Jerome, near the Iron King, opened by tunnel and showing a 30' vein with an 8' pay-streak carrying auriferous bornite and chalcopryrite, with occasional visible gold. Has steam power and employs about 20 men. Property considered promising.

EUREKA HILL MINING CO.**UTAH.**

Mine office: Eureka, Juab Co., Utah. Geo. W. Riter, secretary and manager. Ores carry silver, lead, gold and copper. Has steam power and 100-stamp mill, employing upwards of 100 men at last account.

EUREKA-MABEL MINE.**ARIZONA.**

Mine office: Patagonia, Santa Cruz Co., Ariz. W. A. Balcom, superintendent. Shipped one carload of hand-sorted ore carrying argentiferous galena and gray copper, in 1903.

EUREKA MINING & MILLING CO.**ARIZONA.**

Office: P. O. Box 552, Tombstone, Ariz. Lands, 7 claims, in the

Huachuca Mountains, Cochise county, near the Mexican line. O. B. Steen, president; E. P. Draper, vice-president; F. W. Goodbody, secretary; F. N. Wolcott, treasurer; E. A. Hockley, superintendent. The Copper Glance group, opened by tunnels, is claimed to have shipped more than \$100,000 worth of ore and concentrates, these giving smelter returns of about \$150 per ton, averaging 27% copper, 184 oz. silver and \$6 gold per ton. The Eureka group has produced about \$15,000 worth of ore. Property is considered valuable, but the company is a dead-beat.

EUREKA MINING, SMELTING & POWER CO.

OREGON.

Office: Lewiston, Idaho. Mine office: Imnaha, Wallowa Co., Ore. G. A. Nehrhood, superintendent. Has a 10' ore body carrying auriferous and argentiferous chalcopryrite giving good assay values, with steam power and a \$65,000 smelter, completed in 1903. Employs about 50 men.

EUREKA-OPHIR MINES.

UTAH.

Office: care of J. W. Cairns, Stockton, Utah. Said to have more or less high-grade ore.

EUSTIS MINES.

VIRGINIA.

Owned and operated by Holloway Mining Co.

EUSTIS MINING CO.

QUEBEC.

Mine office: Sherbrooke, Sherbrooke Co., Quebec. Supposed to be producing iron-copper sulphides on a limited scale.

EVANGELINA COPPER MINING CO.

MEXICO.

Office: 204-202½ So. Broadway, Los Angeles, Cal. Mine office: Santa Catarina, Ensenadade Todos Santos, Baja California, Mex. D. R. Wilder, president; J. H. Coleman, vice-president; Josephine H. Wilder, secretary and treasurer; C. L. Ripperdan, superintendent. Lands, about 150 acres, showing outcrops of 15% ore. A fissure vein opened ranges from a few inches to 6' wide with fair ore values.

EVANS-TANZER CONSOLIDATED COPPER CO.

CALIFORNIA.

Mine office: Lavic, San Bernardino Co., Cal. Chas. Tanzer, vice-president; F. H. Lerchen, metallurgist and mining engineer. Said to have erected a roasting furnace planned to operate on a new system.

EVELYN MINING & LEASING CO.

COLORADO.

Office: Leadville, Lake Co., Colo. Morris Sterne, manager. Ores carry gold, silver, lead, copper and zinc. Has steam power and employs about 40 men.

EVENING STAR MINING CO.

WYOMING.

Mine office: Riverside, Carbon Co., Wyo. J. H. Bills, superintendent, at last accounts. Lands, in the Beaver Creek district of Carbon county. Mine is opened by an 800' crosscut tunnel, showing a wide vein with a 2' pay-streak carrying very high-grade chalcocite, malachite and melaconite.

EVERETT MINE.

NORTH CAROLINA.

Presumably in the Virgilina district of Person county, North Carolina. Some machinery was installed in 1902, and owners claimed to have 560,000 tons of 6% ore blocked out, which probably was an overestimate both as to quantity and quality.

EVERGREEN BLUFF MINE.

MICHIGAN.

Lies south of Adventure and Mass mines, in Ontonagon county, Mich. Worked 1854-1863, producing 675 tons, 1,174 lbs. refined copper, at a cost of \$223,582.24.

EVERGREEN GOLD & COPPER MINES CO.

COLORADO.

Office and mine: Apex, Gilpin Co., Colo. Organized 1904, under laws of Colorado, with capitalization \$5,000,000, shares \$1 par. Joseph L. Walters, president and general manager; W. C. Hollister, secretary and treasurer. Lands, 6 claims, 3 patented, also millsite, in the Pine district, showing a large fissure vein carrying good assay values in auriferous and argentiferous bornite and chalcopyrite, opened by 3 shafts of 40' to 80' depth, and tunnels of 150' and 400'.

EXCELSIOR COPPER CO.

ARIZONA.

Office: 421 Olive St., St. Louis, Mo. Lands, near Pima, Pima Co., Ariz. Promoted by the notorious Wm. F. Wernse & Co., Bond & Stock Co., of St. Louis, Mo. These sharpers issued immense quantities of alleged mining stock, all utterly worthless. Firm put out of business by United States postal authorities for fraudulent use of the mails.

EXCELSIOR COPPER CO.

QUEBEC.

Mine office: West Broughton, Megantic Co., Quebec. Mine is developed by shaft, also worked open-cast. Has steam power.

EXCELSIOR COPPER & GOLD MINING CO.

WYOMING.

Mine office: Aetna, Carbon Co., Wyoming.

EXCHANGE GOLD & COPPER MINING CO.

ARIZONA.

Letters returned unclaimed from former office, Nevada Bldg., San Francisco, Cal. Lands were 20 claims, in vicinity of Flagstaff, Coconino county, Arizona.

EXCELSIOR MINING & SMELTING CO.

NEVADA.

Office: Butte, Mont. Letter returned unclaimed from mine office, Yerington, Lyon Co., Nev. John F. Forbes, president; Frank E. Shaw, secretary. Capitalization \$200,000. Property was the Bluestone mine, opened by tunnels, equipped with steam and gasoline power, and having oxide and carbonate ores said to average 10% copper, with a 150-ton water-jacket furnace, installed 1901. Is thought title to property has passed to other hands.

EXCELSIOR MINING CO.

NEW MEXICO.

Letter returned unclaimed from former mine office, Organ, Donna Ana Co., N. M. Gilbert E. Dunbar, owner; Chas. M. Jewell, superintendent. Lands show argentiferous copper ore. Has gasoline power

FAEO GRUBE.

NORWAY.

A group of small Norwegian mines, producing a limited quantity of ore averaging 4% in copper tenor.

FAIRVIEW MINING CO.

MONTANA.

Mine office: Basin, Jefferson Co., Mont. Timothy Downey, superintendent. Ores carry gold, silver and copper. Mine is opened by shaft and tunnel, and has steam power.

FALHERZ- UND KUPFERKIESBERGBAU.

AUSTRIA.

Mine office: Altzech Zapfenschuh, Tyrol, Austria. A small producer of sulphide copper ore.

FAMATINA COPPER & GOLD SYNDICATE, LTD.**ARGENTINA.**

Liquidated; succeeded by Famatina Development Corporation, Ltd.

FAMATINA DEVELOPMENT CORPORATION, LTD.**ARGENTINA.**

Offices: 56, Cannon St., London, E. C., Eng. Mine offices: Chilecito, Rioja, Argentina. Harry J. Meyerstein, chairman; A. Dangerfield, secretary; Florence O'Driscoll, consulting engineer; E. Dangerfield, mine manager. Registered Jan. 21, 1903, with capitalization £400,000, shares £1 par; debentures, £100,000 authorized at 6%, partially issued, to take over mining lands from the Famatina Copper & Gold Syndicate, Ltd. Property is in the Famatina mountains of the Mexicana district of Rioja, Argentina, showing 14 auriferous and argentiferous copper veins averaging about 4' width and claimed to be 2 miles in length. Smelter-site is at Chilecito, 25 miles from mine, and a 25-mile aerial tram is planned to connect the mine and works. It is estimated that this tram should cut the cost of transportation from the present figure of 35s. down to 25s. per ton. The Córdoba Central railroad is to be extended to the district, touching the smelter-site. Water is abundant and wages are about 30c. per day, for natives, whose labor is correspondingly efficient.

LES MINES DE CUIVRE DE LA FARE, LTD.**FRANCE.**

Offices: Dashwood House, New Broad St., London, E. C., Eng. Organized Oct. 25, 1894, as Les Mines Francaises, (name changed to present title November, 1902), with capitalization £47,000, shares £1 par, in £30,000 8% cumulative preference and £17,000 common shares; issued, £19,997. R. Romeu, secretary. Property, somewhere in France, said to be undergoing development and to show 6 mineralized veins.

COMPANIA MINERA DE FARELLON.**CHILE.**

Mine office: Puquios, Copiapó, Atacama, Chile.

FARGO GOLD & COPPER MINING CO.**OREGON.**

Office: Fargo, N. D. Mine office: Imnaha, Wallowa Co., Ore. H. M. Peterson, president; J. A. Husebye, secretary and treasurer; Charles Wallace, superintendent. Lands include the Last Chance mine, producing auriferous and argentiferous copper ores. Has water power and employs about 25 men. Ore is to be reduced by the smelter at the Eureka mine, adjoining.

FARREL COPPER CO.**MONTANA.**

Succeeded by Pittsburg & Montana Copper Co.

FAUQUIER COPPER CO.**VIRGINIA.**

Supposed to be developing a copper property in Fauquier Co., Va.

FAVORITE GOLD & COPPER MINING CO.**WASHINGTON.**

Office: Nelsonville, Ohio. Mine office: Nighthawk, Okanogan Co., Wash. Employs 6 to 10 men. Organized Sept. 25, 1902, with capitalization \$2,000,000, shares \$1 par. J. M. Parker, president; J. F. Baldrige secretary; H. D. James, general manager; Myron J. Church, mine superintendent. Lands, 16 claims, area 300 acres, adjoining the Nighthawk mine, on Mt. Ellemeham, in the Wanicutt Lake district, 34 miles from the Canadian Pacific railway, showing 5 veins of which one, ranging 1' to 5' in width, is

opened by an 850' tunnel showing values in copper, gold, silver and lead, principally the former.

MINA LA FÉ.**MEXICO.**

Mine office: Jimulco, Coahuila, Mex. Pearson & Randall, owners; Geo. Pearson, manager. Ores carry copper, gold and silver.

MINAS FÉ y ESPERANZA.**SPAIN.**

Mine office: Ribas, Gerona, Spain. Were working on a small scale, at last accounts.

FEDERAL COPPER CO.**MICHIGAN.**

Office: 207 First Nat'l Bank Bldg., Duluth, Minn. Organized 1902, under laws of Minnesota, with capitalization \$600,000, shares \$10 par. P. L. De Voist, president; F. D. Adams, secretary and treasurer. Lands, 360 acres, adjoining the Miskwabik, in Houghton township, Keweenaw county, Michigan. Property is supposed to carry the northern extension of the Kearsarge amygdaloid. Conditional merger of lands has been made with the Miskwabik Development Co., which probably will be concluded in 1905.

FEDERAL COPPER CO.**WYOMING.**

Letter addressed to Laramie, Wyo., returned unclaimed. Company supposed to have lands in Carbon or Albany counties, Wyoming.

FEDERAL COPPER CO., LTD.**WISCONSIN.**

See Federal Gold & Copper Co.

**FEDERAL COPPER MINING
& SMELTING CO.****ARIZONA & NEW MEXICO.**

Works office: El Paso, Texas. F. H. Wilson, president; J. Geo. Hillzinger was appointed receiver, September, 1903. Property is a smelter at El Paso, with a blast-furnace and converter of about 100 tons daily capacity, employing about 80 men when running, also mineral lands in the Organ Mountains, Donna Ana county, New Mexico, and a controlling interest in the Dragoon Mining Co., at Johnson, Cochise county, Arizona.

FEDERAL GOLD & COPPER CO.**NEVADA & WISCONSIN.**

Office: 214 Lumber Exchange, Minneapolis, Minn. Mine office: Dayton, Lyon Co., Nev. C. S. Dudley, president. Organized 1902, under laws of Arizona, with capitalization \$2,500,000, shares \$1 par. Lands include 600 acres in the St. Croix Valley, Burnett Co., Wis., and 520 acres 6 miles southeast of Superior, Douglas Co., Wis., these tracts lying on the St. Croix and Minong native copper ranges. Landed holdings in Nevada are 7 claims in the Como district, including the Como-Eureka mine, showing 4 parallel veins, carrying ore with estimated average value of about \$15 per ton. Has a 100-ton concentrator obtaining power from the Dayton river, 8.2 miles distant where a 250-h. p. electric generator has been installed. Mine has considerable development and officers are men of good standing.

FEDERAL GOLD & COPPER MINING CO.**UTAH.**

Office: 612 McCormick Bldg., Salt Lake City, Utah. Mine office: Blue Acre, Beaver Co., Utah. Organized Jan. 20, 1903, under laws of Utah, with capitalization \$1,000,000, shares \$1 par. Hon. Heber Wells, president; A. Stuart, secretary; E. W. Young, general manager; J. E. Meyer,

superintendent; W. A. Wilson, engineer. Lands, 9 patented claims, area 180 acres, in the Beaver Lake district, between the O. K. mine of the Majestic and the properties of the Newhouse company, showing a number of fissure and contact veins carrying gold, silver, copper and lead, in country rocks of granite-porphry, quartzite and limestone, opened by a 40' tunnel and 9 pits and shafts, deepest 80'. Was discovered and worked many years ago, producing about \$100,000 worth of ore, but was long idle until taken over by present company. Development work is planned for 1905. Property regarded as promising.

FEDERAL MINES CORPORATION.

COLORADO.

Mine office: Idaho Springs, Clear Creek Co., Colo. H. A. Moore, superintendent. Ores carry gold, silver, lead and copper. Has steam power.

FEDERAL MINING CO.

ARIZONA.

Office: 29 Broadway, New York. Mine office: Safford, Graham Co., Ariz. Francis H. Wilson, president; H. E. Hutchinson, treasurer; John F. Weber, general manager; Chas. Allin, engineer. Organized 1902, under laws of Delaware, with capitalization \$1,000,000, shares \$10 par. Lands, 24 claims, area 470 acres, also a 5-acre millsite, in the Lone Star district, showing three ore bodies of about 9' average width carrying oxide, carbonate and sulphide ores, latter below the 300' level. Mine is opened by shafts of 130', 325' and 425' and by tunnels of 90', 100' and 300'. Three shipments of ore aggregating 75 tons gave smelter returns of 24%, 28% and 30% copper, with about 2 oz. silver and 80c. gold per ton. Has gasoline and steam power and plans building a 50-ton concentrator on the San Juan claim. Ignatius L. Qualey, former general manager, and Frank S. Weller, former secretary, are in the penitentiary for fraud. Company removed from former office at 1112 Park Row Bldg., New York, and left no address behind, so that any mail addressed there, containing bills, etc., was returned unclaimed.

SOCIETA DELLA FENICE MASSETANA.

ITALY.

Mine office: Massa Maritima, Grosseto, Italy. Veins or lenses range from 6" to 20 metres in width, carrying chalcopyrite associated with iron pyrites in a quartz gangue, and showing occasional native copper. First-grade ore, averaging about 11% copper, is heap-roasted at the mine and smelted at Leghorn, and the second-grade ore, averaging about 3% copper only, is heap-roasted and leached at the mine.

FENOCHIA MINING CO.

MEXICO.

Mine office: Magdalena, Sonora, Mex. Juan Fenochia, manager. Development is by shaft and tunnel. Employs about 20 men.

FENTRESS MINING CO.

NORTH CAROLINA.

Office: 52 Broadway, New York. Mine office: Center, Guilford Co., N. C. Henry J. Dexter, president; Chas. W. Scott, secretary. Main shaft, 178'. Property is the Fentress, or North Carolina mine, opened and worked previous to circa 1860. Has a 3' to 4' vein, dipping at 38° to 60°, opened to depth of 310'. Has steam power and 10-stamp mill, producing gold bullion and copper concentrates. Is said to contemplate doubling milling capacity.

FERNANDO MINING CO.**MEXICO.**

Office: 12 Ashburton Place, Boston, Mass. Mine office: San Fernando, Durango, Mex. Col. T. L. Livermore, treasurer; Courtney de Kalb, manager. Ores carry gold, silver and copper. Has water and electric power, with concentrator, and employs about 250 men. Production, 1903, was 554,609 lbs. fine copper.

FERRIS-HAGGARTY COPPER MINING CO.**WYOMING.**

Controlled by Penn Wyoming Co.

COMPAÑIA DE MINAS FERROCOBRIZAS.**SPAIN.**

Office: San Isidro, 16, Sevilla, Spain. Mine office: El Carpio, Cortegana, Huelva, Spain. Don Salvador Sánchez Castañer, agent. Property includes the Santa Maria de Gracias and other old mines, worked in very ancient days.

SOCIEDAD MINAS FERROCOBRIZAS.**SPAIN.**

Mine office: Cortegana, Huelva, Spain. Property is a group of 11 mines, area 73 hectares, leased to the Sociedad Francaise de Estudios of Paris. A railroad is being built from the mines to Valdelamusa, for shipping the product, which will be cupriferous iron pyrites.

FIDELITY MINING CO., LTD.**MICHIGAN.**

Office: care of I. P. Griswold, chairman, Allegan, Mich. Organized February, 1903, with capitalization \$300,000. Lands, in Section 15, T. 50 N., R. 40 W., 2½ miles northwest of Victoria mine, in Ontonagon county, Michigan. No mining work attempted.

MINA FILOMENA.**CHILE.**

Mine office: Chañaral, Atacama, Chile. Baldomero Luna, owner; N. Rojas, superintendent. Has steam power and employs about 50 men.

FINLETTER & HARVEY.**ARIZONA.**

Office and mine: Globe, Gila Co., Ariz. Lands are in the neighborhood of the Lake Superior & Arizona, and small shipments are made quite regularly, 1903 shipments to El Paso giving average returns of 22% to 27% copper. Present shipments are to the Old Dominion smelter, by wagon, and in addition to high-grade ores the firm is supplying sufficient low-grade silicious ore of 3% to 5% copper tenor to furnish silica for converter linings at that smelter.

FINLEY GOLD & COPPER MINING & MILLING CO.**UTAH.**

Letter returned unclaimed from former mine office, La Sal, Grand Co., Utah. C. A. Finley, general manager. Lands, 3 claims, at the foot of Horse Mountain, carrying ores giving smelter returns of \$32.40 per ton from small shipments.

FITZROY COPPER MINES, LTD.**AUSTRALIA.**

Offices: 70, Bishopsgate St. Within, London, E. C., Eng., and 79, Pitt St., Sydney, N. S. W., Australia. Mine office: Mt. Chalmers, Queensland, Australia. P. Charley, chairman; O. J. Parker, secretary; W. H. Edwards, manager. Organized Aug. 15, 1902, with capitalization £18,000, shares £1 par; issued, 5,000 shares, 7s, 6d. paid in. Property is the Mt. Chalmers mine,

area 140 acres, near Rockhampton, Queensland, reopened October, 1902, after many years idleness. Ores carry copper, gold and silver. Has steam power, 60-ton smelter and 20-stamp mill with vanners. Employed about 50 men at last accounts.

FIVE METALS MINING CO.

Correct title is North Arkansas Zinc, Copper, Lead, Silver & Gold Mining Co.

W. S. FLETCHER MINING & SMELTING CO. ARIZONA & CALIFORNIA.

Office: Braly Bldg., Los Angeles, Cal. Works office: Needles, San Bernardino Co., Cal. Lands include the Banner group on Stockton Hill, 12 miles north of Kingman, Mohave county, Arizona, showing ores carrying about \$30 per ton in gold, silver and lead, also 16 claims near Florence, Pinal county, Arizona, with valuable water rights, on which it is said the company plans building another smelter. Works are at Needles, bought March, 1904, for \$30,000. Present company has expended about \$20,000 in improvements, and present capacity of plant is about 125 tons daily, treating custom ores carrying lead, copper, silver and gold, from western Arizona and southern California.

FLINT STEEL MINE.

MICHIGAN.

A tract of 400 acres, near the Michigan mine, in Ontonagon county, Mich. Produced 415 tons, 458 lbs. refined copper, at a considerable loss. Idle since circa 1875.

FLORENCE MINING, MILLING, SMELTING & REFINING CO.

COLORADO.

Office: Florence, Colo. Lands, 18 claims, in Custer county, Colorado, showing a small vein giving good assays in copper.

F. M. & D. COPPER MINING CO.

COLORADO.

Office: care of Bernard McCaffrey, Denver, Colorado. Mine office: Morrison, Jefferson Co., Colo. Lands, 560 acres, patented, near Bear Creek, about 8 miles west of Morrison, opened by 165' main shaft, upper 150' through gossan capping of 15' to 30' width carrying small gold values, and showing about 5' of ore in bottom, mainly sulphide, with some malachite, said to carry about 11% copper and \$3.50 gold and silver per ton. Also has 600' of tunnels. Employs 17 men.

FOND DU LAC MINE.

WISCONSIN.

A prospect, in Douglas county, Wisconsin, on which two shafts, deepest 65', were sunk in 1899, giving a fine showing of native copper rock, said to have been brought from Michigan for the purpose.

FORAN MINE.

ARIZONA.

Office and mine: Stoddard, Yavapai Co., Ariz. Samuel Foran, owner. A prospect on which a limited amount of development work has been done.

FORD COPPER CO.

COLORADO.

Letter returned unclaimed from former mine office, Georgetown, Colo. Property is in Eldorado county, Colo. Ore values are in gold and copper, former predominating.

FOREST MINE.

Mine office: Darrington, Snohomish Co., Wash. Thos. Parks, superintendent. A prospect, slightly developed by tunnel.

WASHINGTON.**FOREST HILL CONSOLIDATED MINING & MILLING CO. COLORADO.**

Office: 420 Exchange Bldg., Denver, Colo. Mine office: Tin Cup, Gunnison Co., Colo. L. Cavnah, president; J. C. Jensen, secretary and superintendent. Has steam power and two-stamp mill. Company has been endeavoring for many years to develop gold, silver, lead or copper mines, at Tin Cup and elsewhere.

EDWIN FORREST.**NEW MEXICO.**

Office and mine: High Rolls, Otero Co., N. M. Said to have claims showing a 12' vein of copper ore, opened by a 40' shaft.

FORTUNA GROUP.**CALIFORNIA.**

Office: care of E. G. Harrison, owner, Callahan, Cal. Lands are in Siskiyou county, Cal. Ore is chalcopryite associated with pyrrhotite, traversing diorite, opened by shafts with a limited amount of development work.

FORTUNA COPPER CO.**CALIFORNIA.**

Office and mine: Fortuna, Trinity Co., Cal. C. Sweet, president. Lands, 19 unpatented claims, in Trinity county, Cal., near the Humboldt county line.

COMPANIA MINERA LA FORTUNA.**MEXICO.**

Mine office: Tepezalá, Aguascalientes, Mex. Geo. B. Wardman, superintendent. Operates La Fortuna and adjoining mines, opened by shaft, producing copper and silver. Uses animal power and employs about 150 men.

FORTUNA MINING CO.**UTAH.**

Office: care of Geo. F. Richards, Jr., secretary and treasurer, Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. J. D. Wood, president; M. P. Johnson, vice-president. Organized March 10, 1904, with capitalization \$300,000. Lands, circa 200 acres, adjoining the holdings of the Ohio Copper Co., and showing considerable development, were bought of the Bamberger Exploration Co., and sundry other holders.

FORTUNA GRANDE COPPER CO.**NEVADA.**

Mine office: Ely, White Pine Co., Nev. Property includes the Pilot Knob group, carrying auriferous copper ores. Has steam power.

FORTUNE COPPER & FINANCE CO.

Offices; 10, Basinghall St., London, E. C., Eng. Registered July 22, 1901. Capital, nominal, £25,000. Location of lands, if any, unknown.

FORTUNE MINING & MILLING CO.**UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. Elmer Hill president. Ores average 4% to 8% copper, with gold, silver and lead values. Mine is opened by shaft and tunnels. Has steam and electric power, and 50-ton concentrator. Mine is under lease to the Bingham Consolidated.

FORTY-FIVE CONSOLIDATED MINING CO. WASHINGTON.

Mine office: Silverton, Snohomish Co., Wash. Property is in the Monte Cristo district, and is very much tangled up in litigation.

FORTY-SEVEN MINE. WASHINGTON.

Letter returned unclaimed from former mine office, Index, Snohomish Co., Wash. H. McKinnon, owner. Has argentiferous copper ores.

FOULD ET COMPAGNIE. SPAIN.

Office: Paris, France. Mine office: care of Don Guillermo Sundheim, agent, Huelva, Spain. Property includes La Cartagenera and other mines, at Cazalla de la Sierra, Sevilla, Spain, now undergoing exploration.

FOUR B'S MINING CO. COLORADO.

Mine office: Turret, Chaffee Co., Colo. David Allen, superintendent. Operates the Jasper mine, carrying gold, silver and copper ores. Has gasoline power.

FOUR BROTHERS COPPER MINE. WASHINGTON.

Mine office: Silverton, Snohomish Co., Wash. Lands, 4 claims, having about 500' of development work, mainly tunnels, showing ores carrying copper, gold and silver.

FOUR METALS MINING CO. ARIZONA.

Office: 21 South Center St., Phoenix, Ariz. Lloyd B. Christy, president; F. L. Blumer, secretary and treasurer; M. Gross, superintendent. Lands are in the Patagonia district, Santa Cruz Co., Ariz., carrying ores giving fair assay values in gold, silver, copper and lead.

FOUR METALS MINING CO. COLORADO.

Office: Equitable Bldg., St. Louis, Mo. Mine office: Silverton, San Juan Co., Colo. Organized Jan. 17. 1899, under laws of Colorado, with capitalization \$2,000,000, shares \$1 par; issued, \$1,500,000. W. Frank Carter, president; R. M. Scruggs, secretary and treasurer; Joseph H. Shockley, superintendent. Lands, 47 claims, area 516 acres, at Silverton, San Juan county and in Ingraham basin, near Telluride, San Miguel county, Colorado. Has a mill at the Palmyra mine, and a steam plant at the Andrus mine at Telluride.

FOUR METALS MINING CO. UTAH.

Office: care of G. L. Moats, general manager, Salt Lake City, Utah. H. Hugo Brandeis, president; R. P. Hill, secretary. Lands are in the Dugway or Deep Creek district of Utah, and carry auriferous, argentiferous and cupriferous zinc and lead ores. Mine is opened to depth of 400' and has a 50-ton concentrator.

FOURTH OF JULY MINING & MILLING CO. COLORADO.

Mine office: Eldora, Boulder Co., Colo. J. B. Johnson, superintendent. Opened by shafts and has a 220' tunnel planned to cut the Olympic and Fourth of July veins, from which assays of 25% to 45% copper, some lead, 50 to 125 oz. silver and \$30 to \$80 gold per ton have been secured.

DUNCAN FOX y CA. CHILE.

Mine office: Cobija, Tocopella, Antofagasta, Chile. Firm owns a large number of copper claims near Cobija, and elsewhere, in the Tocopella district of the province of Antofagasta.

COMPAGNIE FRANCAISE DES MINES DE CUIVRE D'AGUAS TENIDAS. SPAIN.

Succeeded by Societe Francaise des Pyrites de Huelva.

COMPAGNIE FRANCAISE DES MINES DE CUIVRE D'AKHTALA. RUSSIA.

Offices: Rue Tronchet, 27 bis, Paris, France. Owns copper properties in the Russian Caucasus, supposed to be undergoing development on a limited scale.

SOCIETE FRANCAISE MINIERE ET METALURGIQUE EN SERBIE. SERVIA.

Offices: Rue de Courcelles, 147, Paris, France. Lands are in Servia.

SOCIETE FRANCAISE DES PYRITES DE HUELVA. SPAIN.

Offices: Rue de Chateaudun, 39, Paris, France. Mine office: Valdela-musa, Huelva, Spain. Property includes the Perrunal mine, which produces mainly cupriferous iron pyrites rich in sulphur.

ANDRES FRANCHY. PERU.

Mine office: San Marcelo, Yauli, Perú. Is a small producer of argentiferous copper ores.

SOCIETE MINIERE ET METALURGIQUE FRANCO-ESPAGNOLE. SPAIN.

Offices: Rue de Lisbonne, 8 bis, Paris, France. Location of mines in Spain not learned.

COMPANIA MINERA FRANCO-GALLEGA. SPAIN.

Mine office: Monforte, Lugo, Spain.

FRANKLIN MINING CO. MICHIGAN.

Office: 15 Congress St., Boston, Mass. Mine office: Hancock, Houghton county, Mich. Employs about 600 men. Organized April 3, 1857, under laws of Michigan; reincorporated, 1887, for 30 years; capitalization since increased to \$2,500,000, shares \$25 par. Francis H. Raymond, president; Daniel L. Demmon, secretary and treasurer; R. M. Edwards superintendent; F. H. Raymond, D. L. Demmon, Geo. H. Flint, Josiah Q. Bennett and Joshua D. Hosking, directors; Cyrus Truan, mining captain at old Franklin; John Doney, mining captain at Franklin Junior; Arno Jaenig, Clerk; Edward Warne, mill superintendent.

Official returns to the state of Michigan, as of date Jan. 1, 1904, disclose the following figures:

Amount cash paid in on capital stock	\$1,040,333.58
Entire amount invested in real estate 1894-1898.....	54,901.50
Amount of personal estate.	295,917.45
Amount of unsecured or floating debt.....	127,457.82

Amount paid in by conveyance of property is unknown, as old books were burned.

Lands, 160 acres at the old Franklin; 1,359 acres of surface, also mineral rights to 160 acres, at the Franklin Junior, and a millsite at Grosse Pointe with nearly 200 acres area and one mile frontage on Portage Lake. The old mine consists of the southwest quarter of Section 2, Town 55 North, Range 33 West.

The Junior mine, opened 1860 as the Albany & Boston, was renamed the Peninsula in 1882, and was bought by the Franklin in 1895. The old Franklin is opened on the Pewabic lode, and is surrounded on three sides by the Quincy mine, which has cut off the Franklin from following the amygdaloid beyond the boundary line. The old Franklin is producing about 300 tons of rock daily from shaft No. 3, which is 3,200' deep, and No. 5, which is 2,850' deep, both bottomed at the Quincy line. Mining is almost exclusively scrambling old ground and robbing pillars, lower levels being gutted. The pillars removed are usually of good grade, but the reworked ground varies greatly, ranging from the best grade of stamp rock and heavy copper down to worthlessness. A little native silver is produced by the Pewabic lode, this being picked out by boys in the stamp-mills. The old mill is nearing exhaustion, and may be closed down during 1905, or may hang on with a small production for a year or two longer. The mine employs about 50 power drills, approximately 20 at the old mine and 30 at the Junior.

The Franklin Junior has two separate mines, these being the old Albany & Boston, on the Allouez conglomerate, which is the mine now worked, and the mine opened on the Pewabic amygdaloid several years ago, the latter lying 475' west of and parallel with the first-named mine. The amygdaloid shafts are numbered from north to south, the north shaft being about 900' south of the Rhode Island line and approximately 1,000' deep; No. 1 is 1,100' next south and about 1,600' deep; No. 2 is 1,500' further south and about 1,200' deep; No. 3 is 1,100' next south, and is about 400' in depth. The four shafts are sunk at an angle of 48° 30', on a lode varying in width from 3' to 15' and averaging probably 9'. Average returns secured from this lode were only about 0.45%, or 9 lbs. refined copper per ton of rock crushed, hence the amygdaloid shafts were abandoned February, 1902, but at 2,000' to 2,500' depth a crosscut may be sent to the amygdaloid from the conglomerate workings.

The results given by the Pewabic amygdaloid were so unsatisfactory that the old Albany & Boston mine, on the Allouez conglomerate, was reopened in 1900. No. 1 shaft was cut down to three-compartment size, 7x20' over all, with inside measurement of 6' 6"x18' 6". This shaft, which is 1,835' deep, has a direct hoist, raising 6-ton skips, good for one mile depth. Water is forked from the conglomerate openings by a Cornish pump with 10" lift, the largest of this style in the Lake district, which probably is handling water as cheaply per foot-gallon as any pump in Michigan. The combination shaft-rockhouse is 40x50' on the ground and 96' high.

No. 2 shaft, 1,200' south of No. 1 is 7'x18' 4" over all, and 1,100' in depth. It is sunk 3' under the footwall, to secure firm walls. The equipment includes a temporary shaft-rockhouse and straight-drum duplex-cylinder hoist, brought from No. 1 Amygdaloid shaft, good for 2,000' depth. In addition to the two shafts already opened the Franklin Junior tract has room for 2 additional shafts, one each to the north and south of the present openings.

The conglomerate lode averages 18' to 22' width, with an extreme width of 30', and 3' to 5' of lode-rock is left unmined on the hanging-wall, and no

rock assortment attempted. The conglomerate is more regular in its copper contents than to the northward, where it is very buncy at the old Allouez mine. There is a slight but perceptible evidence of increased values at depth, and a marked tendency toward softer rock and increased values to the southward. The northern drifts from No. 1 are in poor ground, the best ground in the mine, as far as yet opened, being found between shafts 1 and 2, and in the south drifts from No. 2. No. 1 is opening encouraging ground on the eighteenth or bottom level, and the best rock produced by the mine now comes from the ninth level of No. 2 shaft.

In addition to the Allouez conglomerate and Pewabic amygdaloid, the Franklin Junior tract carries the Mesnard epidote, Calumet conglomerate and Osceola and Kearsarge amygdaloids, all opened, or supposed to be opened, by a 975' crosscut sent west from the Pewabic lode, this showing several amygdaloids and one conglomerate carrying copper in unpromising quantities. The formation is found considerably disturbed at that depth, and a deeper crosscut may be driven eventually. There is some question as to whether the Kearsarge bed was opened by this crosscut, and in view of the fine results secured on this same lode but a few miles northward, an attempt may be made to open and test the Kearsarge lode on the Franklin Junior lands. Surface equipment at the mine includes air compressors of 10, 12 and 36 drill capacity, substantial and well-equipped machine, carpenter and blacksmith shops, an office, changing house and a considerable number of comfortable dwellings for employees.

The stamp-mill, at Grosse Pointe, is served by the Mineral Range railroad. The building is of steel, on stone foundations, 177x194' in size, and has a self-supporting, brick-lined smokestack of 7' diameter standing 165' high on a 52' brick foundation. The mill has four Allis-Chalmers heads, each treating an average of about 375 tons daily, equal to crushing 500 tons of softer amygdaloid rock. The heads are equipped with hydraulic separators, which take out considerable heavy copper. Each head has 20 rough jigs, 15 finisher jigs, 6 round tables and one Overstrom table. The jigs are of the Hodge eccentric type with center-shield copper discharges which obviate skimming. Each head has a 1,000-ton rock-bin. The mill has a 16x22" Allis-Chalmers engine with steam supplied by two 500-h. p. Stirling water-tube boilers. Water is furnished by an Allis-Chalmers 15,000,000-gallon vertical compound pump, with 21x42" high-pressure cylinders and 42x42" low-pressure cylinders, with 42" stroke and plungers 37½" in diameter. Water is drawn through a 36" pipe-line running 200' into the lake to a crib protected by ¼" screens. The mill has a 5x12" duplex fire pump with a full outfit of hose and a complete electric light plant. There is a 267' wharf at the millsite, with 18' of clear water alongside, this having coal-hoists and coal-sheds. There are about 20 dwellings at the millsite.

No. 2 shaft begun production June, 1904, since when the mill has been doing full duty, crushing about 1,500 tons daily, of which only 20% comes from the old mine. The Franklin Junior rock is the most refractory now crushed in the district, the average life of a stamp-shoe being but 2 days and

7 hours. The mill is an excellent one, and has been well handled from the start, as have the mines also. Mr. R. M. Edwards, the new superintendent, is an experienced and capable mining man, succeeding Capt. J. D. Hosking, who did excellent work, securing very low operating costs in all departments, and opening the Junior mine under difficulties that would have crushed a man less experienced and resourceful. The Franklin has made small net earnings for the past two years, and with 4 stamps in commission, should be able to secure substantial profits upon the present 15-cent copper market. Production, 1904, was 4,771,050 lbs. fine copper.

FRASER MOUNTAIN COPPER CO.

NEW MEXICO.

Office: Asbury Park, N. J. Mine office: Twining, Taos Co., N. M. Organized 1901, under laws of New Mexico, with capitalization \$1,000,000, shares \$1 par; also has bond issue of \$150,000. In hands of Frank Stoplin, receiver, owing to rascality of former officers. Lands, 400 acres, partly patented, also a 7-acre millsite and 800 acres miscellaneous lands, in the Rio Hondo district, carrying 3 fissure veins partly developed, main vein being 50' to 60' wide and traceable 1,000', showing oxide, carbonate and sulphide ores. Development is by several shallow shafts and 6 tunnels. Equipment includes water-wheel, air compressors, electric lights, shops, hotel and general store. Has a 100-ton concentrator and 125-ton smelter. Ores are claimed to average 4% copper, with good gold and silver values. Property thought to be of value if properly developed and honestly managed.

FREE CUBA MINE.

CALIFORNIA.

Office and mine: Acton, Los Angeles Co., Cal. Ira L. Houser, owner. Mine opened, circa 1860. Has a quartz vein 23' wide, with a 5' pay-streak carrying native copper and high-grade ore. Has steam power and employed 10 to 15 men at last accounts.

FREEHOLD MINE.

AUSTRALIA.

Mine office: Newellton, Queensland Australia. Has ores carrying 10% to 30% copper and 12 oz. to 30 oz. silver per ton.

FREELAND CONSOLIDATED MINES CO.

COLORADO.

Succeeded, 1904, by Freeland Development & Transportation Co.

FREELAND DEVELOPMENT & TRANSPORTATION CO.

COLORADO.

Office and mine: Idaho Springs, Clear Creek Co., Colo. Employs 20 men. J. R. McKinnie, president; Geo. E. Armstrong, secretary and treasurer; Geo. McClelland, general manager. Organized May, 1904, under laws of Colorado, with capitalization \$5,000,000, shares \$50 par. Lands, 130 claims, mainly patented, area upwards of 500 acres, also 30 acres of mill and smelter sites. Property was opened in 1861, and is extensively developed on fissure veins in granite, having produced upwards of \$5,000,000 in gold, silver, copper and lead. Ore is divided into two classes, of which the smelting ore has averaged \$35 net returns and the milling ore \$12 in values. Copper occurs as chalcopyrite. The McClelland tunnel, now 3,600' in length, will drain, ventilate and develop all the principal properties of the company to depths of 1,300' to 3,000', and will connect them with the Colorado &

Southern railway, which runs through the company's lands. Property has electric power, and company plans completing the equipment, which already has cost upwards of \$40,000, during 1905. The company is well managed, and the property is one of undoubted value.

FREELAND EXTENSION MINING & MILLING CO. COLORADO.

Mine office: Idaho Springs, Clear Creek Co., Colo. Jas. A. Wilson, superintendent. Ores carry gold, silver, lead and copper. Has gasoline power.

FREELAND MERCANTILE & MINING CO. COLORADO.

Mine office: Freeland, Clear Creek Co., Colo. W. N. Smith, superintendent. Mine is opened by shafts and tunnels and has steam power. Ores carry gold, silver, copper and lead.

FREMONT COPPER MINING CO. WYOMING.

Office: Fremont, Neb. Mine office: Riverside, Carbon Co., Wyo. Thos. Carroll, secretary and superintendent. Lands, in Purgatory Gulch, are opened by a 225' incline shaft, from which ore giving good assays has been secured. Has steam power.

FRENCH CREEK MINES. PENNSYLVANIA.

An old copper property in Chester Co., Pa. Long idle.

FRESNO COPPER CO., LTD. CALIFORNIA.

Office: 188, St. Vincent St., Glasgow, Scotland. Mine office: Clovis, Fresno Co., Cal. John H. M. Graham, J. P., chairman; H. Grafton Vercoe, managing director at mines. Registered April 2, 1902, by Californian Copper Syndicate, Ltd., with capital, nominal, £175,000. Lands, 480 acres with option on 1,880 acres adjoining, near Pollasky, showing a vein said to be 50' wide, on which four shallow shafts have been sunk, showing ores assaying up to 7% copper and \$2 gold per ton. Has steam power.

FRIDAY & LOWDEN. CALIFORNIA.

Office and mine: Redding, Shasta Co., Cal. Lands, a group of prospects slightly developed by tunnels.

SILBER- UND BLEIERZBERGWERK FRIEDRICHSEGEN GERMANY. AKT.-GESELLSCHAFT.

Mine office: Friedrichsagen an den L., Hessen-Nassau, Germany. Max Rosenthal, president; C. Leuschner, superintendent. Production in 1903 was 380 metric tons of lead ore, carrying 62.43% lead and 46.93 grams silver per ton; 5,524 metric tons zinc ore, avering 46.31% zinc; 50.25 tons spathic iron ore and 8 tons copper ore, averaging 12.1% copper and 11.64 grams silver per ton.

FRISCO CONTACT MINING CO. UTAH.

Office: 209 Dooly Bldg., Salt Lake City Utah. Mine office: Frisco, Beaver Co., Utah. Employs 10 men. Organized under laws of Wyoming, with capitalization \$1,000,000, shares \$1 par. D. P. Rohlfing, president and general manager; Patrick Ryan, vice-president; H. S. Young, secretary and treasurer. Lands, 18 claims, area circa 340 acres, in the Frisco district, showing four contact veins between limestone and andesite one ranging up to 180' width, showing ores that have given assays up to 20% copper, 45%

lead, 3% zinc, 45 oz. silver and 80 cents gold per ton. Has about 2,000' of underground openings, with steam plant, hoists of 50-h. p. and 80-h. p., and necessary mine buildings. Company plans sinking main shaft to depth of 800' and drifting and crosscutting every 100'.

COMPañIA MINERA LA FRONTERIZA.

MEXICO.

Mine office: Cerralvo, Nuevo Leon, Mex. Ores carry silver and copper. Was working about 25 men at last accounts.

FUJITI GUMMI.

JAPAN.

Office. Osaka, Japan. Mine office: Nantaki-mura, Kazuno-gori, Rikuchu, Japan. Property is the Towada mine, located in the midst of high mountains and very difficult of access. Mine, opened circa A. D. 1670, has a vein of 30' to 100' width, carrying disseminated auriferous chalcopryrite and argentite.

FUKADA MINE.

JAPAN.

Mine office: Fukada-mura, Kuma-gori, Higo, Japan. Country rocks are alternate strata of sandstone and clay-slate of the paleozoic group, ore body having strike and dip corresponding to country rocks, and ranging 5' to 10' in thickness. Ore is chalcopryrite, associated with iron pyrites, and averages 5% to 6% copper. Yield in 1900 was 18,266 lbs. refined copper.

FULTON MINE.

NEW MEXICO.

Mine office: Ribera, San Miguel Co., N. M. Shipped several carloads of high-grade copper ore to smelter at Cerillos, in 1902.

FUNATSU GROUP.

JAPAN.

Mine office: Funatsu, Hida, Japan. Ores produce both silver and copper, annual production of latter averaging about 450,000 lbs.

FUNDICION TEMPLEMAN, LTD.

CHILE.

Voluntarily liquidated, July, 1902.

COMPañIA MINERA FUNDIDORA y AFINADORA.

MEXICO.

Office: Monterey, N. L., Mex. Mine office: Panuco de Coronado, Durango, Mex. Operates La Cruz y Anexas mines, producing silver, lead and copper. Employs an average force of about 50 men.

DWIGHT FURNESS CO.

MEXICO.

Office: Guanajuato, Mex. Mine office: Etzatlán, Jalisco, Mex. W. N. Cummings, manager. Property includes the Agua Blanca and Calabaza mines, carrying argentiferous and auriferous copper ores and argentiferous lead ores. The Calabaza mine has a 150' shaft and 500' tunnel, with steam power, and employs about 75 men.

FUROKURA MINE.

JAPAN.

Mine office: Kazuno-gori, Rikuchu, Japan. Discovered 1762; opened 1765; idle 1794 to 1868. Has numerous veins carrying chalcopryrite associated with iron pyrites, hematite and occasional sphalerite and galena, with a clay gouge, traversing tertiary strata and andesite. Production in 1904 was 550,000 lbs. of 97% blister copper.

FURUKAWA COPPER CO.

JAPAN.

Office: Mitsu Bishi Bldg., Yayesco, Kojimachi-ku, Tokio, Japan. Prin-

cipal mine offices: Ashio, Shimotsuke; Innai, Akita; Rioshikaso, Echigo; Aniai, Ugo, Japan. Is much the largest copper producer of Japan and one of the leading mining companies of the world, employing about 25,000 persons and making one-third the copper production of Japan. Junkiche Furukawa, president; R. Kondo, general manager; M. Otagawa, assistant manager; K. Asano, consulting engineer. Property includes 15 copper mines, 3 silver mines and 7 coal mines, the Ashio, Kusakura, Ani, Innai and Kune mines being the principal copper producers.

The Ashio mine, in the province of Shimotsuke, was discovered A. D. 1610 and developed by the Tokugawa government, reaching a productive capacity of 2,000,000 to 3,000,000 lbs. refined copper yearly in the latter half of the Seventeenth Century, and as this output was in excess of the home demand, the surplus was exported to Holland. The property came into possession of the Furukawa company in 1877, in such poor condition that its yield was only about 400,000 lbs. of copper yearly, but by good handling and careful development, coupled with the introduction of the most approved methods and modern machinery, has been made the foremost copper mine of Japan. The country rocks are Paleozoic clay-slate, sandstone and hornstone, with intrusive liparite, numerous metalliferous veins traversing the liparite but thinning out in the Paleozoic rocks. The property has 7 main veins, averaging 6' to 7' in width, all with sharp dips and carrying a little bornite and melaconite in the upper levels, principal values being in chalcopyrite, associated with galena, sphalerite, arsenopyrite and iron pyrites and having a quartz and clay gangue. The deepest mine openings are about 1,200' and the ores give average smelter returns of about 4% copper, with small silver values. The nearest railroad station is Nikko, distant 9 miles over the mountains from Ashio. Supplies are brought in tramcars hauled by bullocks to the foot of the mountains, 5 miles from Nikko, and are transported thence to the mine by two aerial trams, each about 19,500' in length, with some very long and high spans, these crossing the crest of the mountains and descending on the other side to Ashio. Power for the aerial trams is furnished by a water plant, with Pelton wheel, near Ashio. There also is a horse tramway connecting the different mines and smelters. Steam, water and electric power are used, there being 5 electric plants developing about 2,500-h. p., generated mainly from adjacent streams. Much of the ore is handled underground by electric haulage plants, and power drills are used extensively. The mine equipment includes modern machinery, mainly from American and German manufacturers.

The Ashio has a 25-stamp mill and 3 concentrators, ore being concentrated about 4 into 1 and sent to the smelter with an average copper tenor of 15%. A little high-grade ore goes direct to the smelters. The new smelter, completed 1904, has about 750 tons daily capacity, with 3 water-jacket blast furnaces, two converter stands with 7 shells, 40-ton traveling crane, silica mill, blowers, air compressors, and all other devices found in any thoroughly modern copper smelting plant. The Ashio mine alone employs about 12,000 people, including the forces at the copper mines, flux

quarries, smelters, charcoal kilns, offices, etc. The forces include men, women and children, the children and females being employed at light labor only. Wages, while low according to western standards, are much higher than the average in Japan, miners earning 40c. to \$1 per day and smeltermen about 30c. per day, while engineers, carpenters, smiths and other craftsmen are paid 50c. to \$1 per day, and boys and girls in the mills earn 10c. to 25c. per day. Production of the Ashio in 1900 was 13,402,730 lbs., and for 1904 was 14,622,000 lbs. bessimer copper.

The Kusakura mine, at Rioshikaso, province of Echigo, opened in the Eighteenth Century, was bought by the Furukawa company in 1870. S. Gamoh is mine manager. This property shows 4 nearly parallel main veins traversing porphyry and andesite and averaging less than one foot in thickness, though occasionally widening to several feet. The upper workings show bornite and cuprite, with principal values in chalcopyrite associated with galena and iron pyrites in the lower levels. The mine has steam and electric power and a small smelter, employing about 1,000 hands. Production was 1,650,000 lbs. blister copper in 1904.

The Ani, at Aniai, province of Ugo, is a group of very ancient mines, recently modernized in plant and mining practice. Shigeo Kasai is mine manager. The Ani mines have auriferous, argentiferous and plumbiferous sulphide ores of copper, considerable silver values being secured as a by-product. The mine has steam, water and electric power, with a very good modern plant, including a 10-stamp mill and a 150-ton smelter. About 2,500 hands are employed and the production 1904 was 2,264,000 lbs. of 97% blister copper.

The Kune mine, at Sakuma-mura, Iwate-gori, Totomi, was opened in 1726. The ore is chalcopyrite associated with iron pyrites, averaging 6% to 7% copper, occurring in three beds, the upper 100' thick, the middle 12' and the lowest 6' in thickness, the latter splitting into two 2' seams at the bottom. This property, which was taken over recently by the Furukawa company, made only 137,686 lbs. of refined copper in 1898, but is supposed to be producing quite extensively at present.

The Innai mine is at Innai, province of Akita. T. Minami, superintendent. This mine has auriferous and argentiferous copper ores, and is equipped with steam, water and electric power, employing about 1,500 hands.

The operations of the Furukawa Copper Co., not only are a credit to the technical and administrative ability of the Japanese, but are so conducted that its mines would be considered well handled in any copper district of the world. Better and larger machinery is being added yearly, and the executive and administrative staff of the company is given every opportunity to learn the latest and best in mining and metallurgical practice by frequent visits to Europe and North America. In fact, there is none other of the great copper producers of the world that sends its responsible heads of departments so frequently to foreign countries to secure information that will enable them to keep step with the rapid progress now being made in all branches of the copper industry.

FUTURITY MINING & MILLING CO.**COLORADO.**

Office: 370 Bennett ave., Cripple Creek, Colo. Mine office: Newett, Chaffee Co., Colo. H. S. Smith, president, Geo. L. Breithaupt, secretary and manager; Leo. E. Breithaupt, superintendent. Mine has a 352' shaft, developing ores carrying gold, copper and silver. Has steam power, and employs about 25 men. Company plans installing a copper leaching plant.

COMPAÑIA GADITANA DE MINAS.**SPA'N.**

Office: Cadiz, Spain. Mine office: Aznalcóllar, Sevilla, Spain. Capitalization, 3,000,000 pesetas, shares 500 pesetas par; debentures, 2,000,000 pesetas authorized. Marquis de Fiel Pérez Calixto, president; Don José Luis Lacave, treasurer; Don Salvador Viniegra, secretary. Property is La Caridad group of mines, carrying considerable bodies of cupriferous iron pyrites, with considerable development, and in order to furnish shipping facilities for its product, the company is building a railroad of 34 kilometres from Aznalcóllar to the Guadalquivir river. Management is excellent. and property regarded as of considerable promise.

GAGNON MINE.**MONTANA.**

Owned and operated by Colorado Mining & Smelting Co.

GALENA MINE.**MONTANA.**

Mine office: Morris, Madison Co., Mont. D. A. Clapp, manager. Ores carry gold, silver and copper.

GALIZURSKI WORKS.**RUSSIA.**

Located in the government of Elizabetopol, Russia. S. Varavov. proprietor. Production for 1899 was 1,390,095 lbs. refined copper.

GAP MINE.

An old property, in Lancaster county, Pennsylvania, which was the principal American producer of nickel, making some copper as a by-product, until closed in 1893.

GARDNER HILL MINE.**NORTH CAROLINA.**

At Jamestown, Guilford Co., N. C. An old and idle mine, having 3 veins of chalcopryrite disseminated in pyrite, ranging from a few inches to 3' in width, opened by a 110' shaft.

GARDINER, WORTHEN & GOSS CO.**ARIZONA.**

Office and works: Tucson, Pima Co., Ariz. B. L. Worthen, general manager. Has a smelter with 30-ton experimental water-jacket blast furnace burning crude California petroleum, tests of which have been so satisfactory that installation of a 250-ton furnace is planned.

COMPAÑIA MINERA GARDUNO y ANEXAS.**MEXICO.**

Mine office: Coyuca, Guerrero, Mexico.

GARFIELD MINING CO.**UTAH.**

Letter returned unclaimed from former mine office, Brigham, Box Elder Co., Utah.

GARLOCK MINE.**CALIFORNIA.**

Mine office: Garlock, Kern Co., Cal. E. T. Garlock, superintendent. Has steam power and 10-stamp mill, and was working, on very limited scale, at last accounts.

GARRISON GOLD & COPPER MINING CO.**UTAH.**

Office: 63 West Second South St., Salt Lake City, Utah. Mine office; Ibapah, Tooele Co., Utah. J. P. Gardner, president; John S. Garrison, vice-president and general manager; H. B. Windsor, secretary. Lands, 21 claims, on Dutch Mountain, near Ibapah. Presumably idle.

GAVILANES MINING & MILLING CO.**MEXICO.**

Office: 819 Chamber of Commerce, Chicago, Ill. Mine office: Gavilanes, Durango, Mex. Organized Sept. 1, 1904, under laws of Arizona, with capitalization \$2,000,000, shares \$1 par. C. A. Wightman, president; John A. Boland, secretary and treasurer; James E. Boland, manager. Lands, 500 acres of mineral territory and 30,000 acres of timber and grazing lands, also water-rights to 10 miles of the Piaxtla and Pilar rivers. Property includes the old Gavilanes silver mine, a property that has produced, according to official records, 80,000,000 ounces of silver, also sundry undeveloped copper veins. Management considered good and property valuable.

GEIGER MINE.**COLORADO.**

Mine office: Apex, Gilpin Co., Colo. Ores carry gold, silver, lead and copper. Has steam power and employed 10 to 15 men at last accounts.

SUCESION FRANCISCO GEISSE.**CHILE.**

Office and mines: El Espino, Combarbala, Chile. Operates El Espino mine, opened 1896, making 25 to 50 tons of refined copper yearly.

GEISSE HERMANOS.**CHILE.**

Operate copper mines, opened 1875, in the department of Illapel. Chile producing about 350,000 lbs. refined copper yearly.

LUIS L. GELABERT y CA.**PERU.**

Office and mine: Otoco, Lucanas, Perú. Firm produces ores of gold, silver and copper, on a small scale.

GEM TURQUOISE & COPPER CO.**NEW MEXICO.**

Property is a turquoise mine in the Burro Mountains, near Silver City, Grant Co., N. M. Was working 10 to 15 men, 1902-1903.

GEMINI MINING CO.**UTAH.**

Office: Salt Lake City, Utah. Mine office: Eureka, Juab Co., Utah. John Q. Packard, president; E. W. Packard, vice-president; J. E. Berkeley, secretary; L. S. Hills, treasurer; Jackson C. McChrystal, general superintendent. Produces gold, silver and copper. Mine shows a 20' vein of argentiferous and auriferous copper ore, assaying 3% copper, on the 1,600' level. Has steam and water power, with good mining plant. Has paid dividends of \$300,000.

GENERAL ELECTRIC MINE.**ARIZONA.**

Mine office: Clifton, Graham Co., Ariz. No returns secured. Probably idle.

GENERAL GRANT MINING CO.**COLORADO.**

Letter returned unclaimed from former mine office, Pemberton, Douglas Co., Colo.

GEORGE THIRD MINING, MILLING & SMELTING CO.**COLORADO.**

Letter returned unclaimed. Former postoffice at Carson, Hinsdale Co., Colorado, discontinued.

GEORGETOWN GOLD MINING CO.

COLORADO.

Mine office: Georgetown, Clear Creek Co., Colo. Frank B. Branham, superintendent. Ores carry gold, silver, lead and copper.

GERONA COPPER CO., LTD.

SPAIN.

Offices: 3, Clements Lane, London, E. C., Eng. H. Limebeer, liquidator. Property is the Dona 'Trinidad, Don Rafael, Pura Manolin and adjoining mines, at Hostalrich, Gerona, Spain.

GERONA COPPER & LEAD MINES CO., LTD.

SPAIN.

Offices: 19-21, Queen Victoria St., London, E. C., Eng. Mine office: Susquead, Gerona, Spain. Cecil A. Escott, chairman; Albert H. Greenhill, secretary. Registered, August 1, 1900, with capitalization £80,000, shares £5 par; issued, £50,050. Lands, 17 copper and lead mines, bought for £50,000 in shares. Letter returned unclaimed from Susquead.

COMPAGNIE DES MINES DE CUIVRE ET

SPAIN.

DE PLOMB DE GERONA.

French title of Gerona Copper & Lead Mines, Ltd.

GERTRUDE MINE.

ONTARIO.

Owned by Lake Superior Power Co.

GERTRUDE MINING CO.

WYOMING.

Succeeded by Eagle Copper Co.

GEYMAN MINING CO.

MONTANA.

Mine office: Butte, Silver Bow Co., Mont. Lands are a small tract northeast of the Parrot smelter, on which a shaft is being sunk.

GIANT MINING CO.

BRITISH COLUMBIA.

Mine office: Rossland, Trail division, Yale District, B. C. Ores carry gold and copper. Has steam power.

GIANT LEDGE GOLD & COPPER CO.

COLORADO.

Office: 500 Frost Bldg., Los Angeles, Cal. Mine office: Manvel, San Bernardino Co., Cal. Employs 10 to 15 men. Organized July, 1901, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. L. M. Gregory, president and general manager; H. G. Stoddard, secretary; R. W. Kenny, treasurer; Edward Brough, mine superintendent. Lands, 30 claims, also a 40-acre millsite and sundry other lands, with total area of upwards of 800 acres, in the New York district, showing 4 veins, of which 2 are being developed, one being a fissure in granite and the other a contact vein between limestone and granite with average width of 100', giving average assays of 5% copper, 5% lead, 10 oz. silver and about \$4.50 gold per ton, from carbonate and oxide ores near surface and sulphides at depth. Has one shallow shaft and 2 tunnels, with about 4,000' of underground openings, developing a considerable amount of ore. The installation of an aerial tramway, power plant, concentrator and smelter is contemplated. Company has no debts, and is developing conservatively. Property is of considerable promise and management is good, preferring to go slowly and safely.

COMPANIA MINERA LA GIBOSA y ANEXAS.

MEXICO.

Mines, at Jiminez, Chihuahua, Mex.. sold to Guggenheim Exp. Co.

GIBRALTAR COPPER MINING CO.**WYOMING.**

Office and mine: Encampment, Carbon Co., Wyo. Wm. L. Sill, president; Chas. E. Winter, secretary. Has a 4' vein, giving assays of 20% copper, with good gold and silver values. Has a 75' shaft, and installed a good steam plant in 1904.

GIBSON MINE.**ARIZONA.**

Mine office: Globe, Gila Co., Nev. Has a 7' vein of exceptionally high-grade chalcopryite, claimed to run 26% to 32 % copper, furnishing about \$15,000 worth of ore monthly to the Old Dominion smelter at the close of 1904.

GILA MONSTER COPPER CO.**ARIZONA.**

Mine office: Kelvin, Pinal Co., Ariz. Thos. Rutledge and E. P. Grindell, superintendents. Lands include the Confidence mine, with about 1,000' of underground openings, showing auriferous and argentiferous bornite, chalcocite and sundry oxide ores. A 500' permanent working shaft is planned. Property is regarded as decidedly promising.

GILA VALLEY COPPER CO.**ARIZONA.**

Property absorbed by Federal Mining Co., of Arizona.

GILBERT & NORRIS.**MEXICO.**

Mine office: Zacatecas, Zacatecas, Mex. Property opened by shaft and tunnels, with gasoline power. Employed about 40 men at last accounts.

GILBREATH BROS.**IDAHO.**

Mining property sold to Copper King Mining Co., of Idaho.

GILCHRIST & DAWSON, INC.**NEW MEXICO.**

Mine office: Fierro, Grant Co., N. M. J. D. Gilchrist, general manager. Operates the Iron Head and Republic mines, producing copper and iron ores, mainly the latter. Has steam power and employs 40 to 50 men.

GILES GOLD MINING & MILLING CO.**COLORADO.**

Mine office: Ward, Boulder Co., Colo. H. F. Llewellyn, superintendent. Ores carry gold, silver and copper. Has steam power and 10-stamp mill.

GILNOR BELLE MINE.**ALASKA.**

A property of considerable promise, in the Copper River district of Alaska about 170 miles inland from Valdez, which was under bond to George Mitchell at last accounts.

GIRILAMBONE COPPER MINING CO., LTD.**AUSTRALIA.**

Apparently succeeded by Girilambone Mining Co. (No liability.)

GIRILAMBONE MINING CO. (NO LIABILITY.)**AUSTRALIA.**

Office: Sydney, N. S. W., Australia. Mine office: Girilambone, Cambelego Co., Nyngan Division, N. S. W., Australia. G. A. Richards, manager; W. Blakemore, mine manager. Employs about 200 men. Made about 300 tons fine copper in 1898, a little silver being secured as a by-product. Ores are oxides, carbonates and sulphides, in a gangue of schistose and arenaceous slates, with numerous quartz veins and inclusions. Ore occurs as disseminations and replacements, lacking the defined limits of ordinary fissure veins, in slate and sandstone country rocks having occasional hard bands of quartzite. Alteration zone extends down about 200'. Deepest shaft, 520'. Ores are

divided into three classes for treatment. First class comprises carbonates (including cuprite), with average assay value of 4.6%; oxides from the transition zone make the second class, and sulphides from the lower workings constitute the third grade, each class being smelted separately. Reduction is greatly hampered by deficiency of ore in sulphur and iron, and excess of silica. Water supply is very scant, causing trouble in times of drought. Mine has a dam and is compelled to filter and re-use the water repeatedly. Has a 250-ton smelter with 5 reverberatory furnaces and one refining furnace, product being turned out as blister copper of the remarkable purity of 99.95%. At last accounts, October, 1904, was completing a new cementation plant.

GIROUX CONSOLIDATED MINES CO. NEVADA & MEXICO.

Office: 42 Broadway, New York. Mine offices: Ely, White Pine Co. Nev., and Carbo, Ures, Sonora, Mex. Organized under laws of Delaware, with capitalization \$5,000,000, shares \$5 par. Joseph L. Giroux, president; Eugene L. Giroux, vice-president; J. C. Kennedy, treasurer; Isaac M. Price, secretary; Lorren M. Hart, counsel; preceding officers, Jas. A. Snedaker, Conrad Dietz, Guy E. Giroux and Josiah Marvel, directors.

Lands are about 1,450 acres, in 2 groups, one group, of 84 pertenencias, area about 207 acres, being near Carbo, in the Ures district of Sonora, with a second group of about 1,250 acres near Ely, White Pine county, Nevada.

The Mexican claims, known as the Sultana group, about 35 miles from Hermosillo, have 3 shafts, of which the Sultana incline is 1,075' in depth, with about 1,000' of lateral openings, showing considerable ore averaging 3% to 4% copper, with good gold values. Sultana No. 1 shaft is 200' in depth, and the San José shaft is 400' deep, with about 1,200' of laterals. Considerable ore is blocked out, and regular shipments have begun to El Paso, these showing combined and silver values ranging from 92 cents up to \$734.36 per ton, with an average that should render the ore profitable. About 45 men are employed at the Mexican mines.

The Nevada properties are the more important, apparently, and have much more development than the Mexican mines. There are 11 shafts, none under 100' in depth, of which the principal are the Giroux shaft, 450' deep; Alpha, 650'; Taylor, 300', Pilot Knob, 300' and Brooks, 300'. The Giroux shaft, which was reported badly drawn in December, 1904, is stated by company to be in good condition, and is said to show a considerable body of ore, ranging 7% to 15% in copper tenor, on the 300' level, which is in the zone of secondary enrichment, and about 80' above the water-level. The Giroux shaft has about 1,000' of drifts and crosscuts, said to be mainly in ore. The Alpha shaft is planned to be deepened to 1,000'. The mine had 6,205' of openings at the close of 1904, all shafts, drifts and crosscuts, except the 850' Giroux tunnel. The Taylor shaft is of full 2-compartment working size, and drifts on the 150' level are said to show a large body of high-grade sulphide ore, the ores being mainly sulphide, with occasional native copper. The Nevada mines have 4 hoists, air compressors, shops and necessary mine buildings.

A contract has been let to the Colorado Iron Works Co. for a complete

250-ton smelting plant for the Nevada mines. The plant will include a 42x180" water-jacket blast-furnace, blower, air-compressor, converter with one stand and 3 shells, etc., entire plant costing about \$125,000, and under contract to be completed July 15, which probably is several months earlier than the date when the first blister copper will be turned out.

In the description of this property appearing in volume IV, one year ago, the company was censured severely for most misleading advertisements printed in selling stock. The officers of the company took exception to these censures, explaining that the lies were told by the fiscal agents who sold the stock at first, before the agency was taken from them, and the balance of the stock placed by the personal efforts of Mr. Joseph L. Giroux. The company's explanation seems true, but the company necessarily suffered from the lies of the men selling its stock, just as an honest man among thieves is viewed with suspicion because of the bad company in which he is found. The properties of the company are regarded as valuable, and the Nevada mine is considered especially promising, though the company states that the Mexican group is paying all operating and development costs from its shipments to El Paso. The smelter promised for the Mexican group seems to have been dropped for the present, which is the part of wisdom. Opening and equipping one copper mine at a time is a big enough task for any one company.

Mr. Joseph L. Giroux, the president of this company, is a man of excellent standing, and is widely known as a practical mine manager of demonstrated ability, his management of the great United Verde mine having been commended by mining men generally. He also is a man of recognized financial standing, and is very well liked, both by mine managers and workmen, throughout the American southwest and northern Mexico, where he is best known. Because of his high standing personally, and as a practical miner, it is with regret that the Copper Handbook feels compelled to call attention to certain statements made by Mr. Giroux that are unfortunate, to put the case mildly. Mr. Giroux states in a report to shareholders, under date Dec. 31, 1904, that the company can be put on a dividend-paying basis within 6 or 8 months from that date. This manifestly is not improbable—it is impossible—that is impossible, unless the company declares dividends from stock sales, and not from earnings. Mr. Giroux also refers to the Calumet & Arizona mine as worth \$100,000,000—a misstatement that might be looked for in the prospectus of some get-rich-quick, stock-jobbing company, but which should not be made by a man with the experience and unquestioned ability of Mr. Giroux. Based on the highest price for which its shares ever sold, the top price of Calumet & Arizona was about \$40,000,000, in 1903, and was only about \$22,000,000 at the time Mr. Giroux quoted the value at \$100,000,000. Mr. Giroux also makes another statement that cannot go unchallenged, in his report to shareholders dated Oct. 5, 1904, when he says: "We have a vein on surface that excels anything ever seen by mining experts. Think of a vein that shows a width of 1,800 feet and a few thousand feet in length." While this statement does not expressly say that the vein in the

Nevada property is 1,800' wide, no other meaning can be taken from it. The vein at Ely is not 1,800' wide, and it is surprising that Mr. Giroux should become responsible for such a peculiar statement. A copper vein 1,800' wide has yet to be found.

The Giroux company has properties of merit. Development to date has been rapid, efficient and economical. The president is an able and experienced mining man, and if he will confine himself a trifle more closely to facts hereafter, it will be possible, in all likelihood, for the next edition of the Copper Handbook to say more things that are pleasing and fewer that will not be relished by the company.

GLADSTONE MINE.

ARIZONA.

Mine office: McCabe, Yavapai Co., Ariz. Cecil G. Fennell, lessee. Ores carry gold, silver and copper. Has a 790' shaft, sunk on the vein, with levels opened at 100' distances from surface down. Ores carry gold, silver, copper and lead, and monthly production was about 1,000 tons of ore, before the burning of the Val Verde smelter, in 1904.

GLADYS MINING CO.

BRITISH COLUMBIA.

Property is opposite the Monitor, across the Alberni canal. Has 3 open-cuts, close to tidewater, showing high-grade chalcopryite. Ore body apparently is a continuation of the Monitor's vein. Property considered promising.

GLASDIR COPPER MINES, LTD.

WALES.

Voluntarily liquidated, October, 1903.

GLASDIR COPPER MINES (1903), LTD.

WALES.

Registered Oct. 17, 1903, with capitalization £1,000, shares £1 par, as a tentative reorganization of the Glasdir Copper Mines, Ltd., which went into the hands of a receiver in 1902, through foreclosure of mortgage. Property is at Dolgelly, North Wales.

GLASGOW & WESTERN EXPLORATION CO., LTD.

NEVADA.

Offices: 33, Renfield St., Glasgow, Scotland, and 317 McCornick Bldg., Salt Lake City, Utah. Geo. Macfarlane Reid, chairman; Otto Stallman, general manager; Jos. Farren, superintendent; George Cuthbert, secretary. Organized Oct. 28, 1896, with capitalization £30,000, shares £1 par. Manages and is principal owner of the Adelaide Star Mines, Ltd.

GLEN-JENNINGS COPPER MINING CO.

WYOMING.

Mine office: Encampment, Carbon Co., Wyo. M. J. J. Jennings, superintendent. Was developing with a small force, at last accounts.

GLOBE-BOSTON COPPER MINING CO.

ARIZONA.

Offices: Leavenworth, Kansas and 253 Broadway, New York. Mine office: Globe, Gila Co., Ariz. Organized under laws of Arizona, with capitalization \$2,000,000, shares \$1 par. E. W. Crancer, president; W. F. Kennedy, secretary; Geo. S. Andrus, superintendent. Lands, 21 claims, in the neighborhood of the Old Dominion and United Globe mines. Development, begun in 1901, is by a 465' two-compartment shaft, with considerable drifting, showing a 4' vein carrying low-grade chalcopryite with occasional bunches of high-grade bornite, all carrying fair silver values. Has steam power and a good mining equipment.

GLOBE COPPER MINING CO.**ARIZONA.**

Dead. Property now owned by Old Dominion Mining & Smelting Co.

GLOBE COPPER MINING CO.**WYOMING.**

Office: 24 Giddings Blk., Colorado Springs, Colo. Mine office; Hecla, Laramie Co., Wyo. Organized 1901, under laws of Colorado, with capitalization \$1,500,000, shares \$1 par. A. C. Widdicombe, president; J. A. Morrison, vice-president and general manager; John H. House, secretary; Stewart Davis, treasurer; Prof. H. C. Beeler, consulting engineer. Lands, 22 claims, area 438 acres, in the Silver Crown district, showing sundry fissure veins, of which 3 of 7' average width are opened by 5 shafts, of 100' average depth, and by tunnels of 90' and 160', giving estimated average values of 12% copper, 6 oz. to 10 oz. silver and \$5 gold per ton, from sulphide ores. Has steam power and air compressor. Idle from lack of funds.

GLOBE MINING CO.**ARIZONA.**

Office and mine: Globe, Gila Co., Ariz. Eastern office: 506-171 Washington St., Chicago, Ill. J. F. Hechtman, president and general manager; Geo. L. Beach, treasurer; Walter M. De Kalb, secretary and general manager; Chas J. Maybush, mine superintendent. Organized Feb. 19, 1903, under laws of Arizona, with capitalization \$2,500,000, shares \$1 par. Lands, 27 claims, area 540 acres, including 20 copper claims and 7 gold claims, in the Globe district. Country rocks are granite-porphry, quartzite, diorite and syenite, showing sundry fissure veins in diorite, ranging 2' to 100' in width, with iron cappings, and giving assays of 2% to 6% copper, 4 oz. to 30 oz. silver and \$2 to \$28 gold per ton, from oxide and sulphide ores, opened by shafts of 40' and 90' and a 60' tunnel. Property regarded as promising.

GLOBE TRACT.**MICHIGAN.**

Office: care of John Stanton, owner, 15 William St., New York. Property is a tract of 3,200 acres, comprising Sections 1, 2, 3, 4 and 5, in Town 53 North, Range 35 West, Houghton county, Michigan. Property is a rectangle, five miles in length, east and west, and one mile wide, lying next south of the Champion mine. Has been partially explored by diamond drills, operation of which was greatly hampered by an exceptionally heavy overburden of sand and boulders. The Baltic amygdaloid, which was the cupriferous bed sought, was found by 2 holes, proving copper-bearing and of normal size. This bed must traverse the tract for about 6,000'. It is the intention of Mr. Stanton to do the next exploratory work by a working shaft and drifts therefrom, but no definite time has been set for beginning.

GEWERKSCHAFT VER. GLÜCKAUF-NEVIGES.**GERMANY.**

Mine office: Neviges, Rheinprovinz, Germany. Has lead and copper ores, developed by two shafts, and employs about 100 men, producing about 12,000 tons of raw ore yearly.

GEWERKSCHAFT GLÜCKSBRUNN.**GERMANY.**

Merged, 1903, in the Eisfelder Kupfergewerkschaft.

GOAT CREEK MINING CO.**WASHINGTON.**

Mine office: Methow, Okanogan Co., Wash. John R. Cassin, manager. Ores carry gold, silver and copper. Employed 10 men at last accounts.

GODIVA MINING CO.**UTAH.**

Mine office: Eureka, Juab Co., Utah. J. H. McChrystal, superintendent. Ores carry gold, silver and copper. Has steam power and employs about 75 men.

A. GOERZ & CO., LTD.**GERMAN SOUTHWEST AFRICA.**

Offices: 20, Bishopsgate St. Within, London, E. C., Eng.; 26, Rue Lafitte, Paris, France; 8, Behrenstrasse, Berlin, W., Germany, and 4, Fraser St., Johannesburg, Transvaal, South Africa. Lord Battersea, chairman; Amandus Brakhan, Johannesburg, and Henry Strakosch, London, managing directors; Henry Clark, secretary, London. Has extensive holdings in the Witwatersrandt gold fields, also exclusive prospecting rights over 6,500 square miles in German Southwest Africa. Construction of a railroad line from the sea to Swakopmund is planned. Copper ores have been discovered at a number of points in the district controlled by this company.

GOLD ANCHOR MINING CO.**COLORADO.**

Mine office: Alice, Colo. Thos. I. Slater, manager. Ores carry gold, silver and copper. Has gasoline power.

GOLD BELT MINING CO.**MONTANA.**

Mine office: Empire, Lewis & Clarke Co., Mont. Owen Byrnes, superintendent. Operates the Empire and other mines producing gold, silver, lead and copper. Has steam power, 60-stamp mill and 500-ton cyanide plant, employing about 50 men.

GOLD BUG MINE.**COLORADO.**

Mine office: Empire, Clear Creek Co., Colo. N. B. Clough, superintendent. Ores carry gold, silver and copper.

GOLD BUG CONSOLIDATED MINING CO.**WASHINGTON.**

Mine office: Bossburg, Stevens Co., Wash. F. H. Merritt, superintendent. Ores carry gold, silver and copper.

GOLD & COPPER CO. OF BINGHAM.**UTAH.**

Succeeded by Bingham Consolidated Mining & Smelting Co.

GOLD & COPPER CONSOLIDATED MINING & MILLING CO.**ARIZONA.**

Office: 402-130 Dearborn St., Chicago, Ill. Mine office: Groom Creek, Yavapai Co., Ariz. Organized 1901, under laws of Arizona, with capitalization \$4,000,000, shares \$1 par. R. A. Sweet, president and treasurer; J. B. Pogue, secretary; A. J. Pickrell, general manager; J. Chidister, superintendent. Lands, 35 claims, area 700 acres, including the Rockefeller, Chicago, President and Little Kid claims, in the Hassayampa and Big Bug districts, showing numerous fissure veins carrying auriferous and argentiferous oxides, carbonate and sulphide ores of copper, with estimated average values of 7% copper, 46 oz. silver and \$38 gold per ton, with undetermined lead values. Has 34 pits and shafts of 10' to 815' depth, and 21 tunnels of 20' to 800' length, with about 2 miles of underground openings, and company estimates 150,000 tons ore blocked out for stoping. Has a good steam power equipment, with hoists, shops, etc., also a 10-stamp mill, 50-ton cyanide plant and 50-ton concentrator, employing about 50 men. Property has been under development since about 1894. Company claimed mill was running.

night and day, but reports from Arizona were to contrary. Property considered promising, but it is hard to square the company's claims with the facts in the case, and no valid reason has been given for selling stock at the time when it was claimed that the mill was in full operation.

GOLD & COPPER DEEP TUNNEL MINING & MILLING CO. NEW MEXICO.

Office: 8 Public Square, Cleveland, Ohio. Mine office: Elizabethtown, Colfax Co., N. M. Employs 8 men. Organized October, 1900, under laws of New Mexico, with capitalization \$200,000, shares \$1 par. A. T. McIntyre, president; John Pearson, Jr., vice-president; A. A. Dom, secretary and treasurer; W. P. McIntyre, superintendent. Lands, 115 acres on the west slope of Baldy Mountain, in the Moreno district, opened by 2 shafts and a 1,450' crosscut tunnel, opening two large bodies of low-grade auriferous copper ore. Has steam plant with small experimental mill and plans adding power drills and larger mill. Company is developing conservatively and property seems valuable and well managed.

GOLD & COPPER FIELDS SYNDICATE, LTD. AUSTRALIA.

Company voluntarily wound up, March, 1902.

GOLD & COPPER MINING CO. NEW MEXICO.

Mine office: Rociada, Mora Co., N. M. Jos. L. Mott, superintendent. Has auriferous and argentiferous copper ores and a 10-ton smelter.

GOLD-COPPER MINING & DEVELOPMENT CO. SOUTH DAKOTA.

Letter returned unclaimed from former office, Deadwood, Lawrence Co., S. D. Organized February, 1903, to develop lands just outside of the corporate limits of Deadwood.

GOLD HILL COPPER CO. NORTH CAROLINA.

Office: care of C. M. Miller, receiver, 25 Broad St., New York. Mine office: Gold Hill, Rowan Co., N. C. Capitalization, \$5,000,000. Property is the old Gold Hill gold and copper mine, operated spasmodically since circa 1850. Main shaft, 750'. Present company worked on a large scale, 1901-1903, employing as many as 250 hands, but got into financial difficulties, ending in appointment of a receiver, August, 1903, at instance of creditors. Mine is being kept unwatered.

GOLD HILL QUARTZ MINING CO. OREGON.

Office: 111 Fifth Ave., New York. Mine office: Gold Hill, Jackson Co., Ore. C. R. Ray, superintendent. Property includes the Braden, Conger and Elk Creek mines, ores of which carry gold, silver, lead and copper. Has steam power and 10-stamp mill, employing about 40 men.

GOLD KING CLAIMS. COLORADO.

A prospect about one mile east of the Mt. Zirkel mine, at Pearl, Larimer Co., Colo. Idle at last accounts.

GOLD KING CONSOLIDATED MINES CO. COLORADO.

Office: Waterville, Me. Mine office: Silverton, San Juan Co., Colo. W. Z. Kinney, superintendent. Ores carry gold, silver and copper. Has steam, electric and gasoline power and an 80-stamp mill. Said to employ about 100 men and to secure a little copper as a by-product.

GOLD MOUNTAIN MINING CO.**WASHINGTON.**

Mine office: Berlin, King Co., Wash. F. Karl, superintendent. Has antimonial gold-copper ores, opened by tunnel, with water and electric power, and employed 20 to 25 men at last accounts.

GOLD STAR MINING CO.**WASHINGTON.**

Office: 4190 West Belle St., St. Louis, Mo. Mine office: Index, Snohomish Co., Wash. Capitalization \$1,000,000, shares \$1 par. Lands, 6 claims on the south of Copper Mountain.

GOLD TREASURE MINING CO.**MEXICO.**

Went out of business, 1903-1904, with bills unpaid. Was worked by the Arizona Mining & Development Co.

GOLDSMITH COPPER CO., LTD.**BRITISH COLUMBIA.**

Letter returned unclaimed from former mine office, Howe Sound, Burrard district, B. C.

GOLDEN GATE GROUP.**COLORADO.**

Mine office: Conrad, Park Co., Colo. A prospect, near the foot of Badger Mountain, Tarryall district, said to show a vein of 10' to 30', giving assays of 12% to 62% copper, and \$10 and upwards gold, per ton.

GOLDEN KEY MINE.**WASHINGTON.**

Letter returned unclaimed from former mine office, North Bend, King Co., Washington.

GOLDEN MINT MINES, LTD.**NORWAY.**

Voluntarily liquidated, October, 1903.

GOLDEN RULE COPPER MINING & SMELTING CO.**ARIZONA.**

A fraudulent mining company, formerly having an office at 220 Broadway, New York, and supposed to have had 17 claims, near Oracle, Pinal county and Vail, Pima county, Arizona. Was promoted by one Wm. E. Lake, "a prominent church and Sunday school worker" of Yonkers, N. Y., who purchased sundry holes in the ground in Arizona, at a cost of \$500, then organized a million-dollar company thereon, keeping for himself all but the 7 shares required for dummy directors. He then pledged the company to pay him \$15,000, and generously donated 200,000 shares to the treasury. Purchasers thought they were obtaining treasury stock, and Christian friends invested \$125,000, of which only \$15,000 ever has been accounted for. Assets of the company, at the time of the show-down, were a donkey hoist in Arizona and a roll-top desk in New York, the company having lost the hole in the ground on which it was incorporated originally.

GOLDEN STAR MINING CO.**IDAHO.**

Letter returned unclaimed from former mine office, Doniphan, Blaine Co., Idaho.

GOLDEN STATES MINES, LTD.**ARIZONA.**

Offices: 20-21, Lawrence Lane, London, E. C., Eng. C. F. Branton, chairman; G. Thompson, secretary. Capital, nominal, £100,000, share 5s. par; issued, £61,254. Lands, 120 acres, near Copper Creek, in the Dragoon Mountains, Cochise Co., Ariz. Supposed to have a small smelter. Idle.

GOLETA CONSOLIDATED MINES.**CALIFORNIA.**

Mine office: Jordan, Mono Co., Cal. Hugh W. Nelson, superintendent. Primarily a gold mine, but is developing a 6' vein of chrysocolla. Has a 40-stamp mill and cyanide plant, with water power, and employs about 75 men.

GOLINSKY GROUP.**CALIFORNIA.**

Office and mine: care of B. Golinsky, owner, Kennett, Shasta Co., Cal. A group of 12 claims having about 750' of underground openings showing a main ore chute of about 30' width, said to give fair assay values.

MINA DE RUY GOMES.**PORTUGAL.**

Owned and operated by Companhia Mineira Alemtejana.

SUCESION E. GONZALES.**MEXICO.**

Office, mine and works: Guanajuato, Guan., Mex. Smelter is known as the Salgado. Production in 1903 was equal to 5,793 kgs., blister copper.

SUCESION P. GONZALEZ.**CHILE.**

Office and mine: Labrar, Freirina, Atacama, Chile. Product, shipped as matte, is equivalent to 500 to 700 tons of refined copper yearly.

GOOD HOPE MINING & REDUCTION CO.**COLORADO.**

Office: Del Norte, Colo. Mine office: Vulcan, Saguache Co., Colo. Loui Weiss, superintendent. Ores carry gold, silver and copper. Has steam power, but is idle, and will remain so until a matting furnace, which company hopes to build this year, is erected at the mine.

GOODLANDER MINING & MILLING CO.**MEXICO.**

Office: 603 New Ridge Bldg., Kansas City, Mo. Mine office: Moctezuma, Sonora, Mex. Ores carry gold, silver and copper. Mine is opened by shaft. Has steam power and 10-stamp mill.

GOODRICH MINE.**AUSTRALIA.**

Mine office: Yeoval, New South Wales, Australia. An old property, once a considerable producer of gold and copper, reopened, 1902, by a new 450' shaft sunk to get beneath the former workings, which have been reached by a crosscut. Ore assays 18% copper and 4 oz. gold per ton, and occurs in a pipe-vein about 300' in diameter. Mine has given much trouble in the past from caving, and requires very careful handling.

GOOD VENTURE COPPER MINING CO.**NEW HAMPSHIRE.**

Letter returned unclaimed from former mine office, Woodville, Grafton Co., N. H.

GOODVENTURE MINING & MILLING CO.**WYOMING.**

Mine office: Hecla, Laramie Co. Theo. Grout, superintendent.

GOTHIC MILLING, MINING & POWER CO.**COLORADO.**

Office: Masonic Bldg., Peoria, Ill. Mine office: Crested Butte, Gunnison Co., Colo. James Donn, president; M. W. Jones, secretary; F. L. Clemens, general manager; J. T. Bennett, superintendent. Ores, carrying lead, silver and copper, are opened by shaft and tunnel. Has a 50-ton concentrator and two 50-ton smelters. Employs 20 men. Plans developing an available water power.

BERGWERK GÖTTLICHE HÜLFE STOLLN.**GERMANY.**

Mine office: Tannenbachstal bei Brunnhöbra-Georgenthal, Saxony, Germany. Apparently idle.

GOULAIS BAY MINING CO.**ONTARIO.**

Supposed to have capitalization of \$3,000,000, with shareholders mainly residents of Michigan. Lands, about 1,300 acres, on Goulais Bay, 26 miles north of Sault Ste. Marie, Algoma, Ont., on which a little exploratory work has been done. Idle.

GOULD MINING CO.**WYOMING.**

Mine office: Centennial, Albany Co., Wyo. Lands, sundry claims on summit of Centennial Mountain, said to show ore assaying 30% copper and \$50 gold per ton.

GRAFTER MINE.**YUKON.**

Mine office: Whitehorse, Yukon, Canada. A promising property, which is undergoing development. Made first shipment of ore to Crofton smelter in 1903.

GRAHAM COUNTY MINING CO.**ARIZONA.**

Office: 1509-20 Broad St., New York. Mine office: Fort Grant, Graham Co., Ariz. Capitalization \$250,000, shares \$10 par. John W. Manning, president; Schuyler S. Moore, secretary and treasurer; Prof. Geo. A. Treadwell, consulting engineer. Lands, sundry gold-copper claims in the Clark district, on which the company claims to have expended upwards of \$100,000 in development work. Presumably idle.

LA GRAN FUNDICION CENTRAL MEXICANA.**MEXICO.**

Aguascalientes branch of the American Smelting & Refining Co.

LA GRAN PROVEEDORA DE COBRE.**MEXICO.**

The Mexican corporation of the Arizona-Mexican Copper Co.

GRANBY CONSOLIDATED MINING, SMELTING & POWER CO.**BRITISH COLUMBIA.**

Offices: 66 Broadway, New York, and 62 Canada Life Bldg., Montreal, Canada. Mine office: Phoenix, B. C. Works office: Grand Forks, B. C. Employs about 650 men, of whom approximately 400 are at the mines and 250 at the smelter. Jacob Langeloth, president; Jay P. Graves, vice-president and general manager; preceding officers, W. H. Nichols, John Stanton, George Martin Luther, George C. Clark, A. C. James, Geo. F. Baker, Jr., Payne Whitney, Henry Lee Higginson, W. H. Robinson and A. L. White, directors; Northrup Fowler, secretary; Geo. W. Wooster, treasurer; A. B. W. Hodges, general superintendent; O. B. Smith, Jr., engineer.

Organized March, 1901, under laws of British Columbia, with capitalization \$15,000,000, shares \$10 par and non-assessable; issued, 1,336,303 shares, which were listed on the Boston stock exchange April 22, 1903. Said to have issued 16,400 additional shares in 1904, giving outstanding capitalization of \$13,527,000. First dividend, of 1%, amounting to \$133,630.30, was paid Dec. 16, 1903; no dividends were paid in 1904. Boston Safe Deposit & Trust Co., registrar; American Loan & Trust Co., of Boston, transfer agent. Fiscal year ends June 30. Annual meeting, second Tuesday in October.

Lands, 10 claims, area 338 acres, crown-granted, including the Old Ironsides, Knob Hill, Victoria, Grey Eagle, Banner, Tip Top and Triangle claims. Property is a consolidation of the Knob Hill, Old Ironsides and Grey Eagle mines and the Granby smelter. Miscellaneous landed holdings include 61 acres of limestone lands for fluxes, a 540-acre millsite, 59 city lots at Grand Forks, 280 city lots at Phoenix and 500 acres at Carson, B. C.

The ore body is an immense vein of about 400' average width, striking approximately north and south, and with a dip of about 50° to the east at the surface, pitching more sharply at depth. Ore is chalcopyrite, disseminated very evenly throughout the entire vein, averaging about 2% copper, with small gold and silver values, and only 5% to 6% sulphur. This body extends 4,000' on the company's lands and has been proven continuous with practically unaltered values, to a depth of 800' by diamond drill borings, but has been opened to a depth of about 300' only. Mining has been carried on by shafts and tunnels, with occasional open-cuts, but the present policy of development is to work everything open-cast, milling the ore through winzes to the main tunnels for removal from the mine. The 1904 production was about half from open-pits and half from the two shafts operated, but this will be changed to open-cut extraction as rapidly as possible. The open-cuts are worked in 100' benches, from which 50' slices are taken by 3 steam shovels, largest having a capacity of about 1,500 tons daily, ore being shattered by blasting before removal by shovel. The largest opening is about 400x1,000' in area, and a new open-pit on the Grey Eagle property is to be connected by shaft with the main tunnel, the plans of the company practically calling for the mining off of the mountain. Ore reserves are estimated by the company at 20,000,000 tons, but actually are much larger. It is proposed to drive a four-mile double track railway tunnel into the mountain from Boundary Creek, to tap the ore bodies, now opened on surface, at a depth of about 4,000'. Should this tunnel show a continuation of the immense vein at that depth, as it probably will, the Granby's ore body then will be proven much larger than the combined ore reserves of the Rio Tinto.

No. 2 shaft has a 3-ton 12x16" double-cylinder hoist. A 5-compartment shaft is being sunk on the Victoria claim, which occupies a central position in the group. At the portal of the upper tunnel is a 22x55' crusher building with a 2,000-ton ore-bin, receiving ore from the mine, which, preliminary to shipment to the smelter, is put through a Farrel-Bacon style B ore crusher with steel jaws 30x42" in size, of 150 tons hourly capacity, driven by a 100-h. p. electric motor. This crusher is capable of breaking masses of nearly one cubic yard in size to chunks not larger than 7" to 8". A duplicate of this crusher, made by the Jenckes works, was installed 1904 at the mouth of No. 4 tunnel. The crusher weighs 113,000 lbs., and has a frame of semi-steel with tensile strength of 32,000 lbs. to the square inch. Tunnels 3 and 4 are equipped with electric traction, furnishing ore to the Great Northern railway. The mine ended 1904 with 26,237' of underground openings, of which 1,576' were driven during the year.

The mine takes power to the extent of 1,500-h. p. from an electric plant at the Kettle River, 30 miles distant, the falls being capable of generating about 6,000-h. p. The compressor building, 60x121' in size, houses a 60-drill Rand tandem-compound air compressor with 16x30" high-pressure cylinders and 28x36" low-pressure cylinders, capable of compressing 6,000 cubic feet of free air per minute to a pressure of 70 lbs. The compressor is electrically driven by rope transmission from two 700-h. p. type C Westinghouse induction motors. The combination machine shop and smithy is 48x118' in size. The company also owns 20 cottages, two hotels and boarding houses at Phoenix, the Granby hotel being a \$25,000 three-story structure with electric light and steam heat.

The smelter, at Grand Forks, is connected therewith by the Canadian Pacific railway, there being a 2,000' drop in the 20 miles distance between the smelter and mine. The smelting plant is much the largest and best in Canada, having a daily capacity of 2,100 tons, with 6 furnaces, 44x160" at the tuyeres, of which 2 were blown in November, 1904, the plant treating an average of upwards of 2,000 tons daily at the close of 1904. The ore is practically self-fluxing and is charged as mined, without attempts at milling or concentration. The product of the first fusion is a 60% matte, which is blown up in converters to 99% blister copper. Power is furnished by an electric plant of 1,100-h. p., and there are 7 blowers, one for each furnace, and one in reserve. There also is a 20-ton reverberatory tilting furnace. Furnaces are charged automatically, and electric charging devices will be substituted. Slag is granulated and removed by two 8x14" locomotives traversing a 36" slag-track running to the dumps. The converter building is 68x160' in size, and is 100' from the furnace building, with which it is connected by a 40-ton traveling crane carrying matte. The converter shells are 72x100" in size, of the horizontal barrel type. The converter building has a silica-mill, equipped with crusher and grinding-pan, and has three mould-carriers under each converter stand. Product is turned out as a 99% blister copper, carrying gold and silver values, and is shipped to the Nichols Chemical Co., at Laurel Hill, N. Y., for refining. Two additional furnaces, of 400 tons daily capacity each, have been ordered of the Spokane Iron Works, and the converter capacity of the works will be increased. Steel ore bins of 6,000 tons capacity were built at the works in 1904. An ultimate smelting capacity of perhaps 10,000 tons is not impossible, taking into consideration the vast size of the Granby ore bodies.

Much trouble has been experienced in the past in securing adequate coke supplies, and to obviate future difficulties from this source, the International Coal & Coke Co. was organized, in 1903, with a capitalization of \$3,000,000, by practically the same shareholders as those of the Granby, although the corporations are distinct. The International company has extensive high-grade deposits of coking coal at Blairmore, Alberta, Northwest Territory.

The net production of the Granby in 1904, from its own ores, was 13,431.236 lbs. fine copper, 180,844 oz. silver and 47,986 oz. gold. Con-

siderable custom ore was smelted and some matte from other smelters was blown up to blister copper, giving gross products of 17,843,399 lbs. copper, 217,472 oz. silver, and 50,694 oz. gold. The plant handled about 40% more ore in 1904 than in the preceding year, and with the two new furnaces will be able to make a further increase of about 40% from present smelting capacity. During 1903 the costs were \$1.20 per ton for mining, and only \$1.35 for smelting, and 1904 costs probably were lower. The smelting cost is remarkably low already, but the mining costs can be reduced to a considerable extent, with a larger tonnage and improved means for traction.

The company estimates its ore reserves at 20,000,000 tons, but these really are much larger. Some very strong people have become identified with the management during the past 18 months, and the future of the mine is assured. Ultimately copper should be made at a cost of 7c to 8c per pound, applying gold and silver values to reduction of costs. The Granby not only is the foremost mine of Canada, but is one of the really great mines of the world.

GRAND CANYON COPPER CO.

ARIZONA.

Mine office: Grand View, Coconino Co., Ariz. Mine is located near the bottom of the Grand Canyon, 3,000' below the rim. Was operating in a small way at last accounts.

GRAND CENTRAL MINING CO.

UTAH.

Mine office: Tintic, Juab Co., Utah. Patrick Donnelly, superintendent. Is primarily an auriferous silver-lead mine, but carries appreciable values in copper. Is extensively developed and a considerable producer, employing about 100 men.

GRAND DEPOSIT COPPER CO.

NEVADA.

Office: Cherry Creek, White Pine Co., Nev. Organized 1903. John Stanton, president; J. S. Page, secretary; Pierre de P. Ricketts, treasurer. Lands are the Grand Deposit group, said to show considerable ore bodies giving assays of 7% to 12% copper. Was developing with force of about 25 men at last accounts.

GRAND GULCH MINING CO.

ARIZONA.

Mine office: St. George, Utah. James E. Jennings, superintendent. Capitalization \$700,000, shares \$2.50 par. Lands are in Arizona, just across the line from St. George, Utah. Mine is 370' deep, main shaft to be sunk to 500'. Owing to inaccessibility, only very high-grade ores are shipped, these averaging about 50% copper, with small gold and silver values.

GRAND JUNCTION SMELTING CO.

COLORADO.

Office: 79 Milk St., Boston, Mass. Works office: Grand Junction, Colo. I. N. Patterson, president; J. V. Howard, secretary; Geo. E. Marvin, general manager; Henry W. Edwards, superintendent. Is building a 250-ton custom smelter, with steam and electric power, and plans putting plant into commission in spring of 1905.

GRAND MARAIS COPPER MINING CO.

MINNESOTA.

Had lands in Cook county, Minnesota. Letter returned unclaimed from former office in Chicago. Company probably dead.

GRAND MT. LYELL COPPER CO., LTD.**TASMANIA.**

Mine office: Mt. Lyell, Montague Co., Tasmania. At last accounts was doing prospecting work, in Sections 682, 789 and 1674, with a force of 11 men.

GRAND PRIZE COPPER MINING CO.**ARIZONA.**

Property, near Payson, Gila Co., Arizona, was attached for debts, 1902, by Bank of Arizona.

GRAND RAPIDS COPPER CO.**WYOMING.**

Dead. Property sold to Saginaw Valley Copper Mining Co.

GRAND REEF COPPER MINING CO.**ARIZONA.**

Mine office: Aravaipa, Graham Co., Ariz. James Quinn, superintendent. Property is owned by the John W. Mackay estate. Large sums were expended in development, machinery installations and general improvements, the plant including a 3-stamp mill and 90-ton smelter. Idle.

GRAND REPUBLIC COPPER MINING CO.**COLORADO.**

Office: 52-240 La Salle St., Chicago, Ill. Mine office: Pearl, Larimer Co., Colo. Organized 1902, under laws of Wyoming, with capitalization \$1,500,000, shares \$1 par. W. A. McGuire, president; E. V. Boisot, secretary and treasurer; L. D. Godshall, general manager; Saml. Fields, superintendent. Lands, 7 claims, area 70 acres, in the Big Horn district, 7 miles south of Pearl, showing a 3' paystreak, carrying considerable native copper, in a schistose vein cut at depth of 130' by a 200' shaft. Also has a sulphide ore body. Is developing with a small force.

GRAND TRAVERSE & ARIZONA MINING CO.**ARIZONA.**

Office: Traverse City, Mich. Mine office: Cave Creek, Maricopa Co., Ariz. Employs 7 men. Thos. Smurthwaite, president; Frank E. Withey, vice-president and general manager. Organized May 6, 1903, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Lands, 22 claims, area 440 acres, in the Cave Creek district, showing 9 veins, of which 3 are being developed, these having average widths of 8', 14' and 18', and giving assays of 10% to 30% copper, 8 oz. to 12 oz. silver and \$8 to \$120 gold per ton, from oxide, carbonate and sulphide ores. Is opened by 5 pits and shafts, 2 deepest 40' each, and tunnels of 125' and 51'. Nearest railroad, 38 miles.

GRANDVIEW MINING & MILLING CO.**UTAH.**

Said to have lands in Utah, near the Colorado line, from which ore has been secured giving good assay values in gold, silver and copper.

MINAS GRANDE y COBRE GRANDE.**MEXICO.**

Said to be located near Fronteras, Sonora, Mexico, but letters to that address returned unclaimed.

GRANITE CREEK SMELTING & REDUCTION CO.**NEVADA.**

Mine office: Golconda, Humboldt Co., Nev. Martin Lindley, manager. Ores carry copper and gold. Has steam power.

GRANT COPPER MINING CO.**COLORADO.**

Office: Encampment, Wyo. Mine office: Pearl, Larimer Co., Colo. Organized 1901, under laws of Wyoming, with capitalization \$1,000,000.

Leo Davis, president; C. W. Taylor, vice-president; H. D. Ashley, secretary; Theo. Davis, treasurer. Lands, 3 claims, one-half mile from Pearl, said to show a 12' vein giving average assays of 10% copper.

GRASLITZER KUPFERBERGBAU.**AUSTRIA.**

Mine office: Eilenberg, Bohemia, Austria. Mines are very ancient, and were one of the principal sources of European copper supply during the middle ages. Vein is 12' to 15' wide, in clay-slate. Mines were reopened on a large scale in 1901, and a new smelter built, but it cannot be learned that any considerable production was secured, and mines probably are idle again.

GRAY EAGLE & HARD TIMES MINES.**COLORADO.**

Letter returned unclaimed from former mine office, Silver Cliff, Custer Co., Colo.

O. B. GRAY COPPER CO.**NEW JERSEY.**

Mine office: Pennington, Mercer Co., N. J. Organized May, 1901, with capitalization \$250,000. Vein claimed to be 30' wide and one-half mile long. Idle.

GREAT BELCHER GOLD & COPPER CO.**ARIZONA.**

Office: 89 State St., Boston, Mass. Letter returned unclaimed from former office, Real Estate Trust Bldg., Philadelphia, Pa. Mine office: Providence, Yavapai Co., Ariz. Chas. B. Cramp, president; D. F. Murphy, secretary. Was floated by Henry B. Clifford, and at last accounts shareholders were being invited to exchange stock for holdings in the Great Belcher-Bullwhacker-Merger Co., which apparently has not been altogether an unalloyed success, despite the peculiar attractiveness of its title.

GREAT BELCHER-BULLWHACKER MERGER CO.**ARIZONA.**

Office: 517-10 Wall St., New York. Mine office: 26 Lawler Bldg., Prescott, Yavapai Co., Ariz. Supposed to be a consolidation, or an attempt at a consolidation, in 1902-1903, of the Great Belcher Gold Mining Co., Bullwhacker Mining Co., Empress Mining Co., Sunlight Mining Co., and Queen of Arizona Copper Co.

GREAT CENTRAL FREEHOLD MINES, LTD.**AUSTRALIA.**

Offices: Finsbury House, Blomfield St., London, E. C., England, and 47, Queen St., Melbourne, Australia. Mine office: Mt. Hope, Blaxland Co., N. S. W., Australia. D. E. McBryde, chairman; E. Habben, secretary, London; J. Brandon, manager, Melbourne; J. Martin, superintendent, Mt. Hope. Capital, nominal, £500,000; issued, £390,000, shares £1 par. Said to have paid dividends of £202,000, to close of 1899. Lands, 939 acres, at South Mt. Hope, showing large bodies of low-grade ore. Present production averages 400 to 500 tons refined copper yearly. Ores are oxides and carbonates to a depth of about 250', sulphides below. Oxidized ores have a decomposed porphyry gangue, sulphide ores occurring in brecciated porphyry. Has steam power and a smelter. Water supply is occasionally inadequate. Company also owns the Mt. Allan mine, 11 miles distant. Employs about 100 men.

GREAT COBAR COPPER MINING SYNDICATE.**AUSTRALIA.**

Offices: Equitable Bldg., Sydney, Australia. Mine office: Cobar, Robinson Co., N. S. W., Australia. Works office: Lithgow, N. S. W., Australia. Employs 600 men. Dr. Richard Read, mining director; Wm. Longworth, general manager; G. H. Blakemore, mine manager. This is the most important copper producer of New South Wales, having been first opened in 1869, and closed 1892, after failure to reduce sulphides in a reverberatory furnace. Production during this period was 26,611 long tons of fine copper, made from rich oxidized ores averaging 11.07% in copper tenor. Was reopened 1892, by tributors, on a 10-year lease, and at close of 1902 had produced under their management 730,669 tons of ore giving average returns of 3.27% copper. A long-standing dispute between the tributors and the fee-owners was settled in 1903, through the purchase of the property by the tributors, who form the present syndicate, which is not incorporated.

Lands, 80 acres mining lands and 970 acres miscellaneous lands, freehold, including the townsite of Cobar, also the Nymagee copper mine, at Nymagee, the Great Peak gold mine at Cobar, sundry coal mines at Lithgow and Rix Creek yielding good coking coal, and the Lithgow Copper Smelting & Refining Works, at Lithgow. The Great Cobar mine works three veins of nearly vertical dip, known as the East, Middle and West lodes, principal openings being on the latter. Country rock is Silurian slate, and the ore, which is auriferous and bismuthiferous, occurs in lenses, 50' to 70' in width by 200' to 300' in length and of indefinite depth. The ore is mainly chalcopyrite, with some cupriferous pyrrhotite, the average copper tenor of the entire mine being about 4%, with about $\frac{1}{2}$ oz. silver per ton. Ore is won by overhand stoping, with 10' pillars left beside the shafts, and timbering is by bulkheads filled with waste, this being known locally as the "pigstye" system. The ore is first broken in immense masses, then reduced to smaller size by block-holes and pop shots. The West lode, opened by an 820' shaft, is 70' wide at points on the 90-fathom level, and the mine works about 20 stopes. The "New" shaft is 850' deep. The mine has about 11,000' of openings, and is estimated by owners to show about 2,000,000 tons of ore. Owing to the aridity of the country, operations are hampered in dry seasons by lack of water.

The Nymagee mine, at Nymagee, Priory Plains, Mouramba county, N. S. W., was opened in 1880, and is about 50 miles from the Great Cobar, but lacks railway facilities. Country rocks are slates and sandstone, the main ore body being 15' to 20' in width and carrying 10% copper in a chute about 250' long and of indefinite depth. Has 3 shafts, deepest 734', and ores outside of the rich chute average about 2% copper only, hence are unworkable. The Nymagee has a pyritic smelter with good water-jacket blast furnaces and a reverberatory furnace for blowing up matte to blister copper averaging 99.75% in tenor.

The Peak or Great Peak gold mine has a stamp mill, and as the ore is silicious and free from iron and sulphur, it would seem a highly suitable flux for the basic ores of the Cobar and Nymagee copper mines.

The Lithgow smelter has five 100-ton water-jacket blast furnaces, turning out blister copper carrying about \$40 per ton gold and silver values, which is refined in an electrolytic plant, installed 1902. The new smelting plant at the Great Cobar mine has two 300-ton water-jacket blast furnaces with continuous discharge of molten matte and slag into forehearth and thence into settlers, whence slag skims into one-ton Nesmith slag-pots, which are drawn by a small locomotive to the slag-dump. Fuel at mine is wood and bituminous coal, costing, respectively, 7 shillings and 21 shillings per long ton, and for the smelter, coke, costing 42s. per ton, is used.

Production of 1903 was about 9,000,000 lbs. fine copper, produced from approximately 140,000 tons of ore smelted, and in view of the advantages accruing from the new smelter, should have been larger in 1904. The management is cautious yet liberal, and deserves great credit for having taken the mine under many disadvantages and making it a success commercially, and in mining and smelting practice. The Great Cobar is second only to the Wallaroo & Moonta among Australian mines, and bids fair to become an increasingly important producer.

GREAT CONDURROW TIN & COPPER MINING CO., LTD. ENGLAND.

Offices: Broad Street House, London, E. C., Eng. Mine office: Camborne, Cornwall, Eng. Major J. Meade, chairman; H. Batt, secretary; Nicholas J. West & Sons, consulting engineers. Registered Feb. 18, 1902, with capitalization £50,000, shares £1 par. Lands, 100 acres leasehold and mining rights to 200 acres adjoining, leased lands being held on royalty of one-24th when dividends are being paid; one-48th when expenses are being paid, and no royalty when company is not paying its way. Apparently idle.

GREAT DIVIDE GOLD CO.

CALIFORNIA.

Letter returned unclaimed from former mine office, Redding, Shasta Co., California.

GREAT DIVIDE MINES CO.

UTAH.

Office: 14 West First South St., Salt Lake City, Utah. Mine office: Lincoln, Tooele Co., Utah. Employs 4 men. Organized Aug. 15, 1903, under laws of Utah, with capitalization \$2,000,000, shares \$5 par. Henry A. McCormick, president; Walter A. Cooke, vice-president and manager; Joseph H. Hurd, secretary; Rodney T. Badger, treasurer; John B. Taylor, superintendent. Lands, 40 claims, about half patented, area 560 acres, with 10-acre millsite, fairly timbered, showing fissures in and contacts between limestone and Cambrian quartzite, of which the vein now being developed ranges 12' to 50' in width, carrying ores said by company to assay 6% to 20% copper, 2 oz. to 100 oz. silver, and from a trace to \$150 gold per ton. Development is by a 1,300' tunnel. Property was opened 1898, and has been under slow but continuous development since, about \$25,000 having been expended before organization of present company. Management is well regarded and property considered promising.

GREAT DYLFIE LEAD & COPPER MINES, LTD.

An English corporation. Apparently moribund.

GREAT FREEHOLD MINE.**AUSTRALIA.**

Absorbed by Queensland Copper Co., Ltd.

GREAT LAKES COPPER CO.**ONTARIO.**

Office: care of J. Wesley Allison, 51 East 44th St., New York. Organized 1900, under laws of West Virginia, with capitalization \$3,000,000, shares \$5 par. John McKinley president; Horace Williston, secretary, Robert Sloane Bickford, treasurer. Lands, upwards of 4,000 acres, near Sudbury, Algoma, Ontario, carrying nickeliferous chalcopyrite associated with iron pyrites. Has several shafts, deepest 150', also an open-cut, with a considerable amount of ore in sight. The Graf smelting process was tried, but proved a failure. Property is mortgaged, affairs of corporation are in chaotic shape, and no information is furnished shareholders.

GREAT LAKES MINING & MILLING CO.**WYOMING.**

Letter returned unclaimed from Encampment, Carbon Co., Wyo. Probably same as Great Lakes Mining & Smelting Co.

GREAT LAKES MINING & SMELTING CO.**WYOMING.**

Office: Manitowoc, Wis. Mine office: Encampment, Carbon Co., Wyo. Isaac Craite, president; R. W. Burke, vice-president; J. V. Miller, secretary; C. H. Seeger, treasurer; F. C. Miller, manager. Presumably idle.

GREAT LAXEY, LTD.**ISLE OF MAN.**

Offices: Gresham House, London, E. C., Eng. Mine office: Laxey, Isle of Man, Great Britain. Registered, March 3, 1903, with capitalization £30,000, shares 10s. par, with 45,000 preferred and 15,000 deferred shares, to take over the business and property of the Great Laxey Mining Co., Ltd. J. J. Truran, secretary; F. Reddcliffe, mine manager. Mine produces lead, silver, copper and zinc. Property is noted for possession of largest water wheel in the world. A new power plant has been installed, and property is undergoing development. The mine paid considerable dividends under a former management.

GREAT MAMMOTH COPPER MINING CO.**WASHINGTON.**

Had an office at 45 Milk St., Boston, Mass., and 10 claims adjoining the Index-Independent mines, at Index, Snohomish Co., Wash. Promoters sold their own stock and pocketed proceeds. Company lost its lands, and stock presumably is worthless.

GREAT MOUNT LYELL COPPER CO., LTD.**TASMANIA.**

Reorganized, 1903, as Ballarat & Lyell Mines, Ltd.

GREAT NORTHERN COPPER & GOLD MINING**AUSTRALIA.****COMPANY OF QUEENSLAND.**

Liquidated. Property sold to Rosewood Creek Copper & Gold Mining Co., Ltd.

GREAT NORTHERN MINING CO.**WASHINGTON.**

Letter returned unclaimed from former mine office, Baring, King Co., Washington.

GREAT REPUBLIC COPPER & GOLD MINING CO.**ARIZONA.**

Office: 31 Bank of Arizona Bldg., Prescott, Ariz. Mine office: Turkey, Yavapai Co., Ariz. Employs 12 men. John Milton Sullivan, president and

general manager; F. E. Jordan, secretary and treasurer; Geo. W. Oakman, secretary and superintendent. Organized May 1, 1901, under laws of Arizona, with capitalization \$3,000,000, shares \$1 par. Lands, 33 claims, in three groups, area upwards of 600 acres, in the Black Canyon district, on lower Turkey Creek. Has shafts of 91', 136' and 440', and a 315' tunnel, showing 3 veins, stated by company to average 50' in width, carrying malachite, azurite, bornite, chalcopryite and chalcocite, said to average 5% to 5.25% copper and \$1.50 silver per ton. Has a 45-h.p. gasoline hoist, and is only 2½ miles from Prescott & Eastern railroad. Management plans sinking and crosscutting to determine the size of its ore bodies. Officers stand well and property is considered promising.

GREAT STANDARD COPPER MINING CO.

WYOMING.

Office: care of Colonial Security Co., 161 Summer St., Boston, Mass. Mine office: Granite Canyon, Laramie Co., Wyo. Organized Sept. 30, 1902, under laws of Arizona, with capitalization \$1,000,000, shares 50c. par. Dr. Walter H. Parker, president; John Laughrey, vice-president and general manager; Chas. B. Lamont, secretary; M. E. Roberts, superintendent. Lands, 17 claims, also sundry miscellaneous lands, giving a total area of 640 acres, in the Silver Crown district, showing 6 veins of about 8' average width, opened by 18 shallow shafts and pits and giving average returns of about 7% copper from oxides, carbonates, chlorides and sulphides, with occasional native copper.

GREAT VERDE CONSOLIDATED MINE.

CALIFORNIA.

Office and mine: Sisson, Shasta Co., Cal. Is a co-partnership, capital \$20,000, with 4 owners. John Reed Lyle, secretary and treasurer. Lands, 12 unpatented claims adjoining the Balaklala mine, on the Iron Mountain copper belt of Shasta county, showing a fissure vein or lense with an estimated average width of 80' and length of 5,000', carrying chalcopryite giving assays of 6% copper, 6 oz. silver and \$7 gold per ton. Has 5 tunnels, longest 150' and sells ore to the Keswick smelter of the Mountain Copper Co.

GREAT WESTERN COPPER CO.

ARIZONA.

Office: Clinton, Iowa. Mine office: Tombstone, Cochise Co., Ariz. Capitalization \$1,000,000. Wm. J. Young, Jr., president; Edw. Young, secretary; Paul B. Warnekros, manager; D. W. Brown, superintendent. Lands, 23 adjoining claims, in the Dragoon Mountains, showing argentiferous copper ores. Has steam and gasoline power, and plans building a small smelter. Employed about 30 men at last accounts.

GREAT WESTERN COPPER CO.

NEVADA.

Office: 113 Devonshire St., Boston, Mass. Letter returned unclaimed from former mine office, Reno, Washoe Co., Nev. Organized 1901, with capitalization \$1,000,000, shares 10c. par. Geo. D. Burton, president; Frank B. Cox, secretary. Lands, 62 acres, in the Pea Vine district. Has 2 shafts, deepest 200' and an 800' tunnel. Vein claimed to range 2' to 17' in width, and to give assays of 12% copper, with gold values. Has steam power.

GREAT WESTERN GOLD COMPANY.

CALIFORNIA & ARIZONA.

Office: 506 Continental National Bank Bldg., St. Louis, Mo. Mine

office: Redding, Shasta Co., Cal. Capitalization \$10,000,000, shares \$1 par. About \$7,000,000 of stock has been issued at 10c. per share, and the promoters are supposed to have retained a commission of 50% on stock sold. T. S. Henderson, president; O. E. Adams, vice-president; W. Gillette Scott, general manager; P. H. Noel, secretary and treasurer; M. E. Dittmar, consulting engineer; Herbert Haas, smelter superintendent. Lands include the Afterthought mine, the Liberty group, 10 groups of miscellaneous claims and a lease on the Garcia mines in Arizona. The Afterthought mine, area 459 acres, in the Furnaceville district, 20 miles east of Redding, is much the most important of the company's holdings. Developments by former owners include a 300' shaft and 7 tunnels, with aggregate length of about 2,000', showing a large body of sulphide ore, mainly of medium grade, with frequent occurrences of high-grade ore. Company claims ores will average about \$30 per ton in copper, gold and silver values, and is said to plan developing the mine by a double-track working tunnel. Title of the Liberty group, near Redding, apparently is in dispute. This property carries auriferous copper ores of undetermined values.

The smelter, with steam and electric power and a 150-ton Allis-Chalmers blast furnace, was completed early in 1904, but was not in blast at the close of the year.

The company was promoted by T. S. Henderson & Co., of St. Louis, a brokerage concern of dubious reputation. The Afterthought mine is regarded as valuable, but is not likely ever to be made a success by the present management, which is more interested in stock-jobbing than in making a mine.

GREAT WESTERN GOLD & COPPER CO.

UTAH.

Mine office: Park City, Summit Co., Utah. David Evans, general manager. Lands adjoin the Daly Judge, showing vein-matter of about 100' width giving assays of 3% to 5% copper. Company plans driving a 2,000' tunnel to cut this ore body at a depth of about 1,500'.

GREAT WESTERN GOLD & COPPER

MONTANA & COLORADO.

MINING CO.

Office: care of W. J. Willingham, Equitable Bldg., New York. Chas. G. Eckert, president. Organized under laws of South Dakota, with capitalization \$500,000, shares \$1 per. Has a bond and lease on a gold claim at Cripple Creek, Colo., also one claim, area 20 acres, near Butte, Silver Bow Co., Mont. Latter considered promising, but company lacks funds for development.

GREEN HOPE MINING & MILLING CO.

WYOMING.

Office: Omaha, Neb. Mine office: Guernsey, Wyo. Lands are in the Hartville district of Wyoming. Company said to have planned erection of a 200-ton smelter, at Guernsey, but no such smelter built yet.

GREEN MONSTER MINE.

NEVADA.

Mine office: Sandy, Lincoln Co., Nev. Owned by Mrs. Phoebe Hearst, San Francisco, Cal. Frank O. Wilkinson, superintendent. Has a 325' two-compartment vertical shaft. Ores carry copper, silver and lead. Mine

said to have \$200,000 worth of ore in sight, carrying \$39 per ton in copper and silver. Employs 10 to 15 men.

GREEN MOUNTAIN MINE.

CALIFORNIA.

Office and mine: Lewis, Mariposa Co., Cal. O. R. Sydney, owner and manager. Mine had quite extensive development, showing a large ore body, and produced a considerable amount of high-grade oxide and carbonate ores before closing in 1863.

GREEN MOUNTAIN MINE.

COLORADO.

Letter returned from former mine office, Parkdale, Fremont Co., Colo.

GREEN MOUNTAIN COPPER CO.

NEW MEXICO.

Office: 1013-135 Adams St., Chicago, Ills. Mine office: Rinconada, Rio Arriba Co., N. M. Adrian Vanderclout, president; F. E. Roberts, Jr., secretary; T. F. Woody, mine manager. Organized March 18, 1903, under laws of New Mexico, with capitalization \$2,000,000, shares \$1 par; unissued, \$218,100. Lands, 8 claims, area 180 acres, in the Copper Mountain district. Veins are two contacts between slate and quartzite, said to average 30' wide and to be traceable 4,000', carrying oxide and carbonate ores giving assays of 4% to 37% copper, from a trace to 800 oz. silver and 80c. gold per ton. Has 13 shafts, deepest 250', also a 210' tunnel and an open-cut, with 758' of underground development, estimated to show 40,000 tons of ore. Nearest railroad, 8 miles. Company contemplates erection of a 100-ton leaching plant.

GREEN MOUNTAIN COPPER MINING CO.

WYOMING.

Property sold to Saginaw Valley Copper Co.

GREEN MOUNTAIN MINING & MILLING CO.

COLORADO.

Office: 519 Frick Bldg., Pittsburg, Pa. Mine office: Silver City, San Juan Co., Colo. Jos. G. Lee, president; S. J. Crawford, secretary; F. J. Frost, superintendent. Organized under laws of Colorado, with capitalization \$3,000,000. Lands, 19 claims, area about 200 acres, 7 miles from Silverton, with tunnels of 600' and 800', and about 4,000' of underground development. Ores carry lead, copper, silver and gold, and are said to average about \$12 per ton in value. Has steam power and 12-drill Rand air compressor, and plans building a 200-ton mill.

GREENE CONSOLIDATED COPPER CO.

MEXICO.

Office: 24 Broad St., New York, N. Y. Mine office: La Cananea, Sonora, Mex. Organized Sept. 15, 1899, under laws of West Virginia. Capitalization increased, 1904, to \$8,640,000, shares \$10 par. Fiscal year ends July 31. Has 3,219 shareholders. Has paid dividends of \$1,775,020, of which \$1,123,000 were paid in 1904, company beginning bi-monthly dividends of 3%, or 30 cents per share in April, and increasing rate to 40 cents in November, 1904. Wm. C. Greene, president; Mark L. Sperry, vice-president; Philip Berolzheimer, treasurer; Geo. S. Robbins, secretary; Emil Berolzheimer, W. D. Cornish, Wm. C. Greene, Henry Ollesheimer, Myron M. Parker, Alfred Romer, Mark L. Sperry, Edw. B. Tustin and Jacob Weidmann, executive committee; Charles Adsit, Thomas H. Anderson, Emil Berolzheimer, W. D. Cornish, W. B. Devereux, Silas W. Eccles, W. C. Greene, Henry Ollesheimer,

Myron M. Parker, James Phillips, Jr., R. W. Pillsbury, Epes Randolph, Edward C. Rice, Geo. S. Robbins, Alfred Romer, J. B. Showalter, Galen L. Stone, Mark L. Sperry, W. V. S. Thorne, Edward B. Tustin and Jacob Weidmann, directors; Arthur S. Dwight, general manager; John McHenry, mine superintendent; David Cole, concentrator superintendent; K. J. Williams, smelter superintendent.

The mining lands of the company include 4,214 *pertenencias* of one hectarea each, equivalent to 10,412 acres, the tract having a boundary line of $32\frac{1}{4}$ miles, and including about 40 old mines and prospects, located in the Cananea Mountains, in the free zone of northern Sonora, about 20 miles south of the Arizona border. The Cananea range is about 25 miles in length and 6 to 10 miles in width, with a northwest and southeast axis, divided into two plainly marked and nearly equal sections by Puertecitos Pass, the Greene mines being in the southern half of the range and on a mineral belt apparently having a strike nearly parallel with that of the range.

In addition to its mining lands, the company also holds 486,000 acres of timber and grazing lands, the latter under 8-year lease to the Cananea Cattle Co. The mines are in the municipality of Ronquillo and the principal administrative buildings are in that municipality, near the smelter. The company also has platted the townsite of La Cananea, on the mesa to the eastward of Ronquillo, and therein are located the best dwellings, hotels and public buildings. The company holds franchises for electric light, water, ice, traction and telephone services, and is preparing to build a street railway from Chivatera to La Mesa, a distance of about three miles. There was considerable litigation over titles, but the lands were redenounced in 1902 and the Cananea Consolidated Copper Co., S. A., now holds title direct from the Mexican government, the property of the Greene Consolidated Copper Co. consisting of practically the entire stock issue of the Cananea Consolidated Copper Co., S. A. which is registered and protocoized in Mexico.

The Cananea Mountains show marked evidence of strong volcanic action in the remote past. The mines of the Greene are found in a succession of approximately parallel outcrops of altered limestone, alternating with porphyritic dikes, the ore deposits, often of monstrous size, occurring in shear-zones between the limestone and porphyry, and as replacements in the latter. The ore bodies are entirely distinct and vary greatly, affording practically every variety of oxide, carbonate and sulphide ore, with considerable native copper. Many of the ore bodies are silicious, requiring concentration to eliminate the silica occurring as quartz, and also as aluminum silicate. None of the ore carries zinc or other refractory elements, and the process of concentration is comparatively simple. There are large gossan outcrops, but appearances sometimes are deceptive, and much of what appears gossan at a distance proves upon closer inspection merely weathered conglomerate showing reddish-brown stains closely simulating the iron colors.

The Greene has been the object of constant slander, from innumerable sources, almost since the day of its organization. The lies printed about

the property and its management would fill a library. Everything from the management down to the last detail of the mine has had every rivet of its harness tried by the arrows of malice. While most of these lies have been malicious, a few have been told out of sheer ignorance. The mine has been depreciated in many quarters, and misunderstood in others. An expert—and one of good standing, whom it is charitable not to name—made a careful examination of the mine, early in 1904, and his report was used—strange to say—by enemies of the company, inside of the management, before the company, which paid for the report, received it at all. It is very rarely that any report, good, bad or indifferent, ever has been so fully, finally and forcibly disproved in a twelvemonth as this report in question, which stated that there was a “zone of impoverishment,” which strange to say was located just below the bottom workings. Unfortunately for the expert in question, the shafts were pushed down forthwith into this alleged “zone of impoverishment” and, strange to say, the alleged zone of decreasing values has proven, without exception the richest part of the mines.

The mine has about 25 miles of underground openings, and among these are 20 miles of the best drifts, shafts and tunnels to be found anywhere. The ore in sight amounts to nearly four years supply, containing gross values to the extent of twenty to twenty-five millions of dollars. From April to July, 1904, the ore gave average smelter returns of 7.3% copper, but this probably is above the average of the entire mine. The timber used in the mine is mainly Oregon fir and pine, consumption being about 15,000,000' annually.

Ore extraction is by shafts and tunnels, the latter being used wherever possible, which is in most cases, the mountains lending themselves to the opening of the mines by tunnels. The main working tunnels are double-tracked and equipped with electric lights throughout. During 1904 an entirely new ore body, known as the Massey was opened, and this alone, so far as developed, would make one of the greatest copper mines of the world. This ore body, assaying 8% in copper, with gold and silver values of \$2 or upwards per ton, has been opened for 450' in width and 1,200' in length without determining its width, length or depth. Apparently it is much the largest single body of high-grade copper ore ever uncovered in any mine.

The mineral holdings of the Greene are divided into 5 zones, these being the Cobre Grande, Veta Grande, Esperanza, Capote and Puertecitos, each of these zones including a number of different mines. The Cobre Grande and Puertecitos are practically idle, the principal production coming from the Capote, Veta Grande, and Esperanza zones, in about the order named. The mines are a network of shafts and tunnels, with eight main working shafts and as many main tunnels.

The Cobre Grande, which was the original mine of the Greene Consolidated, was worked in a crude way, for many years, by the Pesqueria family, but is now the least important of the series. This zone shows concentrating ore only, and while the mine has more than a mile of underground openings, the production is slight, as its ores though by no means to be despised, are

inferior in grade to those found more readily accessible and in greater profusion elsewhere.

The Veta Grande has an enormous ore body with a pitch of 36° and a strike of 42° . At the time of my visit, in June, 1903, this ore body had a proven depth of 824' with an average length of 726' and an average width of 216', giving, at a minimum estimate, 6,000,000 tons of ore, apparently averaging better than 10% copper. Since that time additional levels prove fully up to the average grade, the ore body holding its own in both values and size. The Veta Grande ore is mainly soft chalcocite with a gangue of talc and occasional massive quartz, carrying large quantities of native copper and a small amount of iron pyrites, with a little massive chalcocite. Extraction is principally through a 986' double-track tunnel, but the new Veta Grande tunnel No. 9, 6,236' in length, serves both the Veta Grande and Oversight mines, connecting with the Capote tunnel, and accommodating 10-ton electric trams. In addition to the main ore body previously referred to, there is a 150' ore body on the hanging wall, ranging 3% to 6% in tenor, the silicious portions of which are used for converter linings. This mine is all timbered with square sets and worked-out stopes are filled in with waste. The ore is mined in 100' sections, leaving 100' slices unmined, and as the worked-out stopes are filled in, it will be possible to mine out the untouched portions when the first sections are exhausted, unless the surface should be stripped previously. The Veta Grande ore bodies are overlaid by a heavy felsite capping, estimated to contain 830,000 cubic yards, and the management has given consideration to the advisability of stripping off this surface rock. Present mining costs are about \$2.64 per ton in the Veta Grande and it is estimated that nearly \$2 per ton, or about \$12,000,000 on the ore already developed, could be saved by stripping and working the entire ore body open-cast. No. 5 shaft on the Veta Grande has 3 compartments, working two of these in balance with a 115-h. p. double hoist good for 1,000' depth. This shaft has a 7-drill air compressor, smithy, timber-framing shops, etc. The Oversight mine, served by the previously mentioned Veta Grande tunnel No. 9, has large ore bodies of excellent average grade, ranging up to 25% in copper tenor, with increased values shown on the bottom levels, opened in 1904.

The Capote zone, including a number of mines, is the principal producer of the Greene Consolidated, and is very extensively opened. The four principal shafts are known as Nos. 2, 4, 6 and 8, the deepest being about 900', but, like the other mines, the Capotes produce principally through tunnels. The ore is rather peculiar in nature, consisting essentially of iron pyrites with a coating of chalcocite in the form of extremely thin films, the copper-coated iron pyrites occurring in thin crystalline grains scattered quite uniformly through immense bodies of talc. The Capote ore is highly silicious and requires careful concentration to secure the best smelting results. The main working level of the Capote zone has a double-track tunnel connecting shafts Nos. 2, 4, 5 and 7 at an extreme distance of 2,900'. The Capote ore body has a minimum width of 165' and a maximum width of 225' and is

estimated by the company to have exposed 11,000,000 tons of ore, although this estimate might be increased without damage to the truth. No. 2 shaft has a 110-h. p. hoist and No. 4 has a powerful double hoist good for a depth of 3,000', also a 7-drill air compressor and a 50-kw. direct-connected generator furnishing light and power for the Capote workings. No. 10 Capote has been given a Prescott pump of 1,250,000 gallons daily capacity. The bottom levels are showing very well indeed, both as to quantity and quality of ore, and the mine shows richer in the "zone of impoverishment" than above.

The Elisa mine, 1,500' south of No. 2 Capote shaft, produces a silicious chalcopryite rich in gold and silver. On the second level of the Elisa the vein is about 20' wide for a distance of some 500' and averages 4% to 6% copper, while on the third level the vein has about the same width and carries 8% to 10% copper. The main shaft at the Elisa is 540' in depth.

The Esperanza zone, as yet but slightly developed, is known to carry good ore bodies, and probably will be worked from the Capote shafts at a depth of 500' to 600'.

The Puertecitos zone, the westernmost of the group, is about 4 miles northwest of the Elisa shaft of the Capote, and is the largest ore deposit yet developed by the Greene. The ore body is of immense size, having an outcrop about 800' wide. The upper workings show considerable malachite, azurite, and occasional cuprite and native copper, but the principal values at a little depth are in chalcopryite, with occasional bornite, in a lime-alumina-garnet gangue. The workings of the Puertecitos zone are known as the Ventura, on the east, Juárez, 1,200' next west, and Elenita, 900' west of the Juárez. The deepest shaft is the Ventura, about 700' in depth, and the Elenita has exposed very rich ores in grading for surface structures. These shafts have developed ore sufficient to render each in itself a very large mine. The Elenita and the other mines of the Puertecitos zone were worked under check during the latter half of 1904.

The main power plant, near the smelter, has a 65x245' engine-house and a 46x216' boilerhouse, both of steel, with iron sides and roof, the boilerhouse having coal-bunkers with a storage capacity of 3,500 tons. The power plant has 3 engines with direct-connected 100-kw. dynamos, and one 200-kw. direct-connected dynamo, giving a total of about 700 h. p. This plant furnishes a 250-volt current to operate the various shops, briquetting plant, silica-mill, electric cranes, etc., and also furnishes light for all mine buildings and for the towns of La Cananea and Ronquillo. The machine shop, also of steel frame, is excellently equipped with the most modern machinery and supplemented by a foundry having a 2-ton casting cupola. The carpenter shop and planing mill have a complete sash-and-door equipment and all necessary woodworking machines and tools. The warehouses are large and carry heavy stocks. Pneumatic tools are used extensively, power being furnished by Rand compressors.

The concentrators are on a hillside between the mines and smelter. The old concentrator is built in two independent sections of 300-tons daily capacity each, and all material is handled by gravity, after being dumped

into bins from narrow-gauge cars. The building has 3,400 sq. ft. of floor surface, and for each section the equipment includes one set of 36x14" Davis rolls; 2 sets of 27x14" Allis-Chalmers rolls; two 18" bucket elevators; 10 trommels; four 36" single Hartz jigs; two 36" double Hartz jigs; 22 concentrating tables; 4 slime tables; 18 Frue vanners and 3 Bryan mills for re-grinding. The material is treated by wet crushing and water concentration, and much of the silicious concentrate must be briquetted before smelting. The old concentrator power-house has four 100-h. p. boilers and a tandem compound 250-h. p. condensing engine, with a 300-ton coal-bin and 200,000-gallon water storage tanks, the concentrator using about 200 gallons of water per ton of ore.

The old concentrator proved both insufficient in size and poorly adapted to handling the various grades of ore produced from the different mines, hence a new concentrating plant was designed in 1903, and has been partially built. Designs and superintendence were by Dr. L. D. Ricketts of Phelps, Dodge & Co., one of the world's foremost authorities on the theory and practice of metallurgy. The new plant is terraced throughout, and is in four sections, of 500 tons daily capacity each. The cost of the completed concentrating plant will be about \$250,000. Sections A and B were completed early in 1904 and C and D were finished at the close of the year. Superstructure is of steel throughout, with corrugated iron sides and roofs. Foundations for all machines are concrete on rock base, independent of the wooden floors. The new concentrators have 2,000-ton ore bins, and the new plant has a separate crusher building, from which the crushed ore is carried in a 36" belt conveyor to the concentrators, native copper and chalcocite being hand-picked from the belt in transit. The new plant has 72 Frue vanners and 80 Wilfleys, and owing to the scant water supply, water from the coarse jigs is sent to the jig floor and used upon the middlings, and water from the middlings is used upon the sands and thence back to the coarse jigs again. From the Wilfleys the water goes to thickeners and from the tailings the water is recovered in settling tanks, the percentage of water recovered by this ingenious combination of economies being 87.5%, which means that every gallon does duty eight times. The new concentrator puts about 3.6 into 1, and all material is handled automatically from the time when dumped into the bins until the concentrates are drawn off into the ore cars.

The furnace building, of steel frame with iron sides and roof, is 33x296' in size, with 4,200-ton ore bins and 3,000-ton coke bins. All material is handled by gravity, as far as possible. The smelter has eight Mitchell economic hot-blast, air-jacketed furnaces, one of 42x120"; one of 42x180"; two of 42x201"; one of 48x120" and three of 54x160" at the tuyeres. Over each furnace is a 20x20x20' steel dust chamber, planned to collect flue-dust and return it to the smelting zone of the furnace, by gravity, but unfortunately this plan failed to work according to theory. Leaving these primary individual dust-chambers the furnace gases go to a main dust-chamber 250x250' in size, through a dust-flue of 10x13x400'. Smoke and gases are

discharged from the main dust-chamber through a self-supporting steel stack 16' 6" in diameter and 190' high. Much of the ore smelted being pulverulent, an excessive quantity of flue-dust is produced, and the plant as originally designed was totally inadequate to saving this, in consequence of which the losses in flue-dust were tremendously heavy, until obviated by the construction of the new and greatly enlarged dust-chamber.

There are 30-ton detached settlers before each furnace, giving a continuous discharge of slag into self-dumping slag-cars, of which there are 22, with capacity of 30 to 52 cubic feet each, drawn to the slag-dumps by two 40-h. p. and two 25-h. p. electric locomotives. The matte is drawn off into ladles and taken by electric crane to the converter department. In the engine house of the smelter there are 3 blowing engines, one a 225-h. p. Nordberg with 13x24" steam cylinders and 57x57x42" air cylinders, with a capacity of reducing 20,000 cubic feet of free air per minute, and two Murray-Corliss tandem compound blowing engines of 125 and 375-h. p., also 3 smaller blowers, giving a total capacity of 1,100-h. p. and 92,500 cubic feet of free air per minute, compressed to a pressure of $2\frac{1}{2}$ lbs. per sq. inch. The boilers have an aggregate capacity of 3,000-h. p., and there is a 12" main steam line into the boiler room. Coal is fed by gravity from bins. The water storage tanks at the smelter have a capacity of 596,000 gallons, with 9,300' of water mains and 4,000 of $2\frac{1}{2}$ " fire hose.

The converter building is 60x396', of steel frame with iron sides and roof, and fitted with two electric traveling cranes with double auxiliary hoists, of 40' and 50' span and each with a clear hoist of 40' to the main blocks. The capacity of the conversion plant is 8,000,000 lbs. per month. There are 6 stands of converters, with 22 shells 11' in diameter by 13' long made of 1" steel plate. The hydraulic cylinders are 24" in diameter with a water pressure of 200 lbs. to the square inch, and can rotate the shells through a radius of 270°. The converters blow off into movable hoods leading to primary and secondary dust-chambers for gases. A railroad track runs under each converter stand and the casting-cars are fitted with six 300-lb. ingot moulds each, there being 24 cars and 250 moulds. After casting, the ingots are carried in the cars to the bullion floor, where the pigs are chipped, weighed, sampled and loaded, all sampling being done by electric drills. The converter slags are taken back in ladles, by crane, to the forehearths, thus saving resmelting. Blast for the converters is supplied by three engines with an aggregate of 1,700-h. p. and capacity to compress 29,750 cubic feet of free air per minute to a pressure of 15 lbs. per square inch.

At the eastern end of the converter building is the lining department, with silica-mill, pneumatic rammers, etc. All raw material is handled by gravity, from 600-ton silica bins. The silica mill has one 10x20" Blake crusher, two 26x15" Argall rolls, one 8' automatic mixing-pan, conveyors, elevators, etc., and takes power from a 125-h. p. electric motor.

The briquetting plant has a 225-ton Mould plunger press and a 100-ton White mineral press, and briquettes are sent by belt conveyors to the charging floor of the smelter. Owing to the immense amount of material requir-

ing briquetting, a large number of men are employed on handwork, and it is planned to erect a new briquetting plant to have a daily capacity of 400 tons. Such a plant should pay for itself within a few months. In addition to the ore treated at its own plant, shipments of some thousands of tons were made to El Paso smelters during 1904.

The blister copper from the smelter is refined electrolytically, by the United Metals Selling Co., at Perth Amboy, N. J., and the Nichols Chemical Co., of New York, the Greene Consolidated having a long term contract for electrolytic refining at \$15 per ton, which is a very favorable rate.

The mines and works are connected by about 30 miles of wagon road having a maximum gradient of 7%, and there also are about 25 miles of trails. The company owns upwards of 400 horses, mules and burros, and has a large corral for their care.

The mines and works are connected by an 11-mile 36" gauge private railroad, laid with 35-lb. and 45-lb. steel rails and equipped with two 28-ton Porter and one 38 and one 40-ton Baldwin locomotives, with ten 25-ton and twelve 30-ton steel ore cars, 3 coke-cars, 4 flat-cars, 2 box-cars and a caboose. This railroad was excessively crooked and had some 5% grades, consequently the locomotives could haul but three loaded cars, until rebuilt throughout, with much easier grades and curves, doubling the hauling capacity of each locomotive. Railroad connection with the outside world is over the Ferrocarril Cananea, Rio Yaqui y Pacifico, built by the company and sold to the Southern Pacific, a 25-year freight contract made at the time of the sale assuring very favorable freight rates.

The question of fuel always is an important and frequently an urgent one with mines in Northern Mexico and the American Southwest. The Greene endeavors to carry a 90-day stock of coal and coke, to guard against strikes, floods and other contingencies, and keeps two fuel agents between the works and the coal mines to expedite shipments and receipts.

One of the most serious problems in the development of the Greene property was that of water supply. Potable water is piped from Sawmill Cañon and a little water was secured from the Capote and Cobre Grande shafts. It soon became apparent, however, that the water supply was precarious and consequently a costly but necessary plant was installed at Ojo de Agua, on the headwaters of the Sonora river, $9\frac{1}{4}$ miles from the mine. The pumps have capacity to force 1,750,000 gallons daily through a 10" steel pipe-line, against a head of 967', to a reservoir on the hills above Ronquillo, whence water is delivered to the mine, reduction plant and towns under a substantial working pressure. The water system of the company has about 25 miles of mains, ranging in size from 2" to 10", and owing to the cost of securing water, it is clarified and re-used, wherever possible.

The Greene owns 5 office buildings, 11 dwellings for foremen, boarding houses with capacity to care for 900 men, 6 lodging houses and about 200 cabins for miners. There are 3 boarding-houses of 10 rooms each, 1 of 16 rooms and 1 of 42 rooms, all of brick. The company also owns a restaurant, bakery, meat market, etc., and maintains a scavenger service in the

municipality of Ronquillo. There is a two-story brick hospital, 40x100', with detached kitchen and beds for 50 patients, also a 6-ward emergency hospital at Chivaterra, and a fine club-house for employes. The mercantile plant includes a brick store, carrying an immense stock, with warehouses having direct railroad connection, and a branch store at Chivaterra. The company also owns and operates the Banco de Cananea, organized January, 1902, with a capital of \$200,000, Mexican, which does a large and highly profitable business, Ignacio Macmanus being cashier. There also is a brick-yard with a daily capacity of 35,000 brick, and the company maintains a telephone system having about 200 miles of wire and about 100 phones, also an independent telephone system used for dispatching on the narrow-gauge railway. There are two sawmills, with a combined capacity of 14,000 feet daily, cutting lumber from the company's timber lands.

The mines and smelter employ upwards of 4,000 men, about 80% of whom are Mexicans, with several hundred American skilled workmen and about 300 Chinese. Wages average \$3.50 to \$4 gold per day for Americans, and about \$3 silver per day for Mexican miners, this being highest wages paid native workmen by any Mexican mine.

For the fiscal year ending July 31, 1904, the Greene's production was 55,014,339 lbs. fine copper, and at the close of 1904 the mine was making nearly, but not quite 6,000,000 lbs. fine copper monthly. For 1905 the mine should crowd 75,000,000 lbs. production, putting the Greene in active rivalry with the Calumet & Hecla, Rio Tinto and Copper Queen for third place among the world's producers.

The company's outstanding floating debt is said to have been cleaned up early in 1904. A proposed bond issue in 1904 was headed off by Col. Greene, by the issue of \$1,440,000 of new stock. Rumors of the ousting of Col. Greene from the management were current during 1904, as in the two preceding years, but the campaign of slander waged against the company showed a considerable falling off in gross tonnage, the "authentic and absolutely authoritative statement that Greene was out of it" being used only three times in 1904, as compared with 4 times each in 1903 and 1902. In other departments the slander factory kept up to its normal output, and the results were fully as successful as in previous years, Col. Greene and his friends voting 98% of the stock represented at the last annual meeting.

GREENBACK MINE.

CALIFORNIA.

An old property, said to be of value, about 35 miles from Bakersfield, Kern Co., California.

GREENHORN COPPER MINING CO.

COLORADO.

Mine office: Cañon City, Fremont Co., Colo. Mrs. Wm. E. Johnson, Metropole Hotel, Denver, Colo., administratrix, is the principal shareholder, and practically manager of the company. Lands, sundry copper claims, 12 miles from Cañon City, on which some development has been secured, showing low-grade copper ores.

COMPAÑIA MINERA GREGORIA.

MEXICO.

Letter returned unclaimed from Minillas, Zacatecas, Mexico.

GREGORY-BUELL CONSOLIDATED GOLD MINING & MILLING CO. COLORADO.

Mine office: Central City, Gilpin Co., Colo. Property is the Buell mine, carrying ores of gold, silver and copper. Has steam power and a 45-stamp mill, employing about 25 men.

GREYHOUND GROUP. IDAHO.

Mine office: Challis, Custer Co., Idaho. A group of 12 claims, on Keystone Mountain, about 6 miles from Challis.

GREYTON COPPER MINES CO. WYOMING.

Office: care of Thos. Potter, secretary, Denver, Colo. Organized January, 1902, with capitalization \$75,000, shares 5c. par. W. H. Kistler, president. Lands, 12 claims, in the Encampment district of Carbon county, Wyoming, near the Colorado line, opened by sundry pits and shallow shafts, deepest 70', showing cuprite and copper sulphides.

GRIBBELL ISLAND COPPER CO. BRITISH COLUMBIA.

Office: Fairhaven, Wash. Lands are on Gribbell Island, Skeena River Division, Cassiar District, British Columbia. Company worked about 40 men in 1901 and 1902.

GRIFFITH CONSOLIDATED MINE. COLORADO.

Mine office: Georgetown, Clear Creek Co., Colo. Hood & Maxwell, owners; Will C. Hood, superintendent. Ores carry gold, silver, lead and copper.

GRIGGSTOWN MINE. NEW JERSEY.

Letters returned unclaimed from former mine office, Griggstown, Somerset Co., N. J. An old property, reopened for short time in 1901, but again idle.

GROWLER COPPER CO. ARIZONA.

Office: 15 Exchange St., Boston, Mass. Mine office: Gila Bend, Pima county, Ariz. Is a reorganization of the Boston Gold-Copper Mining Co. Capitalization \$2,000,000, shares \$5 par. H. T. Schoeffler, president; Geo. H. Morville, Jr., vice-president; Herbert Moseley, treasurer. Lands, 400 acres, also two 5-acre millsites, 68 miles west of Gila Bend, opened by a 150' tunnel.

GUILLERMO GRUNDY. PERU.

Office and mine: Musquituni, Lampa, Peru. Is a small producer of copper-silver ores.

MINA GUADALUPANA. MEXICO.

Mine office: Topia, Durango, Mex. Felix Briones, owner. Ores carry copper and silver. Employed about 40 men at last accounts.

GUADALUPANO MINING CO. MEXICO.

Mine office: Torres, Sonora, Mexico. H. H. Douglas, manager. Has silver-lead-copper ores, developed by shaft. Has steam power and a 20-stamp mill.

MINA GUADALUPE. MEXICO.

Mine office: Muleros, Durango, Mex. José B. Nava, owner; R. Romo,

manager. Development is by open-cut, on a considerable body of copper ore. Employs 50 to 75 men.

GUANAJUATO COPPER CO.

MEXICO.

Said to have copper claims in the vicinity of Guanajuato, Mexico. Careful investigation has not located the property.

**SOCIEDAD ESPAÑOLA MINAS DEL CASTILLO DE
LOS GUARDAS.**

SPAIN.

Office: Bilbao, Spain, Mine office: Los Guardas, Sevilla, Spain. Mining property is in course of development.

GUARDIAN COPPER MINING CO.

MONTANA.

Organized Nov. 21, 1904, under laws of New Jersey, with capitalization \$100,000, shares \$100 par, by Frederick Eckstein, et al. Property is a fifth interest in the Minnie Healy mine, at Butte, Silver Bow county, Montana.

GUAYNOPA SMELTING & REDUCTION CO.

MEXICO.

Merged, 1904, in International Consolidated Smelting & Mining Co.

GUAYNOPITA COPPER CO.

MEXICO.

Office: 24 Broad St., New York. Organized late in 1904, with capitalization \$5,000,000, shares \$10 par. Property presumably is located in Guaynopa Cañon, Chihuahua, near the Sonora line, about 135 miles south of that so-called "short route" to the Yaqui gold-fields, yclept the Rio Grande, Sierra Madre & Pacific railway.

GUGGENHEIM EXPLORATION CO.

MEXICO & COLORADO.

Office: 71 Broadway, New York. General mine office: Tiburcio, 27, Mexico, D. F. Company has very close affiliations with the American Smelting & Refining Co., developing mines which supply ores to the latter named company's various smelting plants. Organized June, 1899, under laws of New Jersey, with capitalization \$17,000,000, shares \$10 par; issued, \$10,500,000. Daniel Guggenheim, president; Morris Guggenheim, vice-president and treasurer; W. W. Porter, secretary; John Hays Hammond, general manager; A. Chester Beattie, assistant manager. Annual meeting, first Tuesday in June.

The Silver Lake mines, at Silverton, San Juan county, Colorado, produce ores of gold, silver, lead and copper, and have steam, water and electric power, with a 400-ton concentrator and employ about 200 men. S. I. Hallett, superintendent.

The Santa Maria y Anexas, at Velardeña, Durango, Mexico, have auriferous and copriferous silver-lead ores, extensively opened. The mines have steam and gasoline power and a 500-ton smelter, employing about 600 men.

La Gibosa y Anexas, at Jimenez, Chihuahua, Mexico, were bought 1903. L. M. Soule is superintendent.

The Mina Tepezalá at Tepezalá, Aguascalientes, Mexico, has silicious silver-copper pyrites, opened by a 560' main shaft. Robt. Brendell, superintendent. Has a good power plant and employs several hundred men.

The Dolores y Anexas, at Matehuala, San Luis Potosi, Mexico, include the Dolores, Trinidad, and Azul mines, employing about 500 men. F. J.

Foster, superintendent; L. A. Roan, engineer. Lands, 93 pertenencias, area 230 acres. Veins occur as contacts between limestone and porphyry, carrying sulphide ores with garnetiferous gangue returning an average of 7% copper, 3.8 oz. silver and \$1.50 gold per ton. The San Miguel shaft is 600' deep and the San Miguel tunnel is 1,500' long, the mine having about 8,000' of underground openings. Has gasoline power and is reached by the Porvenir de Matehuala railroad. Production of copper in 1902 was 2,481,832 lbs., from 17,756 metric tons of ore treated, giving an average return of 6.34% copper, and in 1904 the production was about 4,015,000 lbs.

GULF CREEK, LTD.**AUSTRALIA.**

Offices: 6, Drapers' Gardens, London, E. C., Eng. Mine office: Barraba, N. S. W., Australia. Hon. Arthur George Brand, M. P., chairman; W. L. Bell, mine engineer; Geo. S. Burton, secretary; Walter Bell, general manager. Registered August 1, 1899. Capitalization increased, 1903, to £60,000, shares £1 par.; debentures, £10,000 at 6%. Lands, 250 acres, in the Gulf Creek district of the Barraba division, N. S. W., 350 miles north of Sydney and 72 miles from a railroad. Ore bodies include a 9' vein of 7% sulphide ore, also a 10% lense of sulphide ore 25' wide and 350' long. Ore is very heating, being rich in copper. Country rocks are indurated clay-slates, of carboniferous age, with dikes of serpentine. Has steam power and 300-ton smelter, employing about 150 men. Production for 1901 was 560 long tons refined copper, from 9,400 tons of ore smelted.

GUM TREE GOLD MINING & MILLING CO.**COLORADO.**

Mine office: Idaho Springs, Clear Creek Co., Colo. J. F. Antisdale, superintendent. Ores carry gold, silver, lead and copper. Has steam power and employed about 15 men at last accounts.

GUNN'S PEAK COPPER MINING CO.**WASHINGTON.**

Office: 217 Columbia St., Seattle, Wash. Mine office: Index, Snohomish Co., Wash. A. M. Watt, superintendent. Lands, 4 claims, showing 3 veins carrying chalcopryrite giving average assays of 11% copper and about 2 oz. silver per ton. Has about 500' of development, by tunnels and cross-cut.

GUNSIGHT GROUP.**ARIZONA.**

Sundry claims lying near the Crescent property, in Tombstone Canyon, north of Bisbee, Cochise county, Arizona.

GWIN MINE DEVELOPMENT CO.**CALIFORNIA.**

A property in Calaveras county, California, now operated as a gold mine, which also has a large body of low-grade copper ore.

GWYNANT COPPER MINES CO., LTD.

Offices: 34, Copthall Ave., London, E. C., Eng. J. K. Lamont, secretary. Capitalization £30,000. Location of mining property, if any, not learned.

GYMPIE COPPER MINES, LTD.**AUSTRALIA.**

Offices: 826, Salisbury House, London Wall, London, E. C., Eng. Mine office: Gallangowan, Fitzroy Co., Queensland, Australia. Lieut.-Gen. Sir James Bevan Edwards, chairman; Matthew T. Wigham, secretary. Registered March 27, 1900, with capitalization £150,000, shares £1 par; issued

£130,007. Lands, 120 acres leasehold and 80 acres under option. On Lot 25 a 15' vein giving assay values of £6 per ton was opened. Idle.

HADLEY CONSOLIDATED COPPER CO.

ALASKA.

Office: 310 Meigs Bldg., Bridgeport, Conn. Absorbed the Wales Copper Mining Co., 1904. Lands, 7 claims on Mt. Andrews, Prince of Wales Island, Alaska, developed by shafts said to show sulphide ores giving average assay values of 12.5% copper, 85 cents silver and \$4.10 gold per ton. Is supposed to have a small smelter in the vicinity of Coppermount.

HAGGARTY-JORDAN MINING CO.

WYOMING.

Office: Watertown, N. Y. Mine office: Battle, Carbon Co., Wyo. Organized 1901, under laws of Delaware, with capitalization \$150,000, shares 10c. par. C. H. Dunbar, president; Delos S. Dunbar, secretary and treasurer; C. W. Jordan, superintendent. Lands, 11 claims, area 220 acres, in the Battle Lake district, showing 4 fissure veins, of which 2 are being developed, these averaging 4' wide and giving estimated average values of 35% copper, a trace of silver, and \$5 gold per ton, from carbonate and sulphide ores. Has very limited underground development. Company suffered a mysterious burglary, by which all its books and papers were stolen. Officers reported to have resigned in a body. Company apparently gone to the bad beyond hope of redemption.

HALIFAX COPPER CO.

VIRGINIA.

Office and mine: Virgilina, Halifax Co., Va. Property is the Wall mine, which made small shipments of ore in 1900. Probably idle.

HALL MINING & SMELTING CO., LTD.

BRITISH COLUMBIA.

Offices: 1, Leadenhall St., London, E. C., Eng. Mine office: Nelson, B. C. Employs 125 men. Registered June 6, 1900, as reorganization of Hall Mines, Ltd., with capitalization £325,000, shares £1 par; issued, £275,000. Debentures, £50,000 authorized; issued, £24,560 first mortgage 6% bonds, redeemable at 105 on 6 months' notice, at option of company. Lord Ernest W. Hamilton chairman; C. Harvey, consulting engineer; A. E. Ashley, secretary; J. J. Campbell, business manager; M. S. Davies, mine superintendent; Robt. R. Hedley, smelter superintendent. Lands, 506 acres, on Toad Mountain, including the Silver King, Hall and Highland mines, also a quarter interest in the Emma mine, near Summit. Mines have auriferous and cupriferous silver-lead ores, the Silver King, carrying bornite above and argentiferous tetrahedrite below, the lower levels not looking so well as the upper workings.

The smelter, at Nelson, near the mine, has one large and one small furnace, with hand and mechanical roasters, but is not thoroughly modern. Product is an auriferous and argentiferous lead-copper matte of 33% to 50% in combined tenor. Mine and smelter have both steam and electric power. For year ending June 30, 1904, production was 6,155 tons of pig lead, 130,800 lbs. fine copper, 1,137,709 oz. silver and 9,331 oz. gold, in addition to which the Silver King, leased to tributors, yielded ores carrying 318,124 lbs. copper and 92,856 oz. silver.

HALLIWELL COPPER CO.

MICHIGAN.

Office: Cleveland, Ohio. Organized 1901, under laws of South Dakota,

with capitalization \$3,000,000, shares \$1 par, non-assessable. Louis Poplowsky, president; A. H. Weed, vice-president; Chas. W. Voth, secretary; C. F. Uhl, treasurer; H. H. Reeves, superintendent. Lands, 880 acres, in Carp Lake Twp., Ontonagon Co., Mich., carrying sundry copper-bearing amygdaloids. Has two shafts, of 130' and 190', and tunnels of 190' and 200'. Has steam power. Is 17 miles from the Chicago, Milwaukee & St. Paul railway. Company contemplates sinking shafts on the Noble and Black Amygdaloid lodes, but did not resume work in 1904, as planned.

CLEMENTE HAM.**MEXICO.**

Mine office: Promontorios, Alamos, Sonora, Mex. Is a producer of copper ores, which are smelted to matte near mine. Production in 1902 was 191.2 metric tons of matte, probably averaging about 55% in tenor.

HAMILTON MINE.**MICHIGAN.**

Now owned by Copper Crown Mining Co. (of Michigan).

HAMILTON MINING, MILLING & TRANSPORTATION CO. COLORADO.

Mine office: Winfield, Chaffee Co., Colo. John G. Paine, superintendent. Ores carry copper, silver and gold. Mine is opened by shaft and tunnels.

HAMLEY COPPER MINE.**AUSTRALIA.**

Office: care of John S. Scott, secretary, Grenfell St., Adelaide, South Australia. Mine office: Moonta, Yorke Peninsula, South Australia. Property was opened 1861, under name of Karkarilla mine. Property shows 6 parallel veins, averaging 3' width, and carrying mainly bornite and chalcopryite, with occasional chalcocite, giving average returns of about 3.8% fine copper. Deepest shaft is 1,020'. Production, 1904, was about 500,000 lbs. refined copper.

HAMMOND COPPER CO.**MONTANA.**

Letter returned unclaimed from former office, 18 Broadway, New York. Lyman M. Loomis was president and treasurer, and Joseph Howard, secretary. Last heard of company was a charge of fraud preferred against officers by a Baltimore shareholder, in 1902.

HAMPDEN MINES.**AUSTRALIA.**

Mine office: Cloncurry, North Queensland, Australia. Has large bodies of sulphide ore, 528 tons of ore shipped to smelters at Wallaroo in 1901, having averaged 36.5% copper. Cannot be worked profitably without railroad connections, or smelter at the mines.

HAMPTON MINE.**COLORADO.**

Mine office: Central City, Gilpin Co., Colo. W. C. Hughes, manager. Ores carry gold, silver and copper. Has steam power.

HANAWA MINE.**JAPAN.**

Owned and operated by the Mitsu Bishi Gosshi Kwaisha.

HANCOCK MINES CO.**NEW MEXICO.**

Letter returned unclaimed from former office, St. Louis, Mo.

HANCOCK MINING CO.**MICHIGAN.**

Office and mine: Hancock, Houghton Co., Mich. August Mette, agent. Area, 160 acres, much of which is now built over by the city of Hancock. Idle since 1885. Lode is narrow, but fairly rich. Total production, 2,854 tons, 1,384 lbs. refined copper.

HANE COPPER MINING CO.**MONTANA.**

Office: care of H. L. Elton, president, Butte, Silver Bow Co., Mont.

HANOVER COPPER CO.**NEW MEXICO.**

Office: 1502-11 Broadway, New York. Organized under laws of South Dakota, with capitalization \$1,000,000, shares \$100 par. Charles W. White, president and treasurer; R. K. Wartman, secretary. Company expended about \$75,000 on development of mining claims near Hanover, Donna Ana county, New Mexico, but work was done under inexperienced management, and company allowed title to lapse through non-payment of balance due on bond, meanwhile securing sundry other claims, presumably in same neighborhood on which no mining has been done as yet. Company plans resumption of mining work in near future.

HANOVER MINING & MILLING CO.**NEW MEXICO.**

Office: Albuquerque, N. M. Mine office: Hanover, Grant Co., N. M. J. W. Bible, manager. Lands include several mines, and it is planned to increase ore production to about 150 tons daily.

HAPPY CREEK MINE.**NEVADA.**

Mine office: Lovelock, Humboldt Co., Nev. Frank Reynolds, superintendent. Is claimed to have a ledge 60' wide, in serpentine, giving assays of 37.5% copper, 20 oz. silver and \$3 gold per ton, but these figures should be scaled down from 50% to 90%.

HAPPY JACK MINING CO.**ARIZONA.**

Mine office: Patagonia, Santa Cruz Co., Ariz. W. H. Barnett, superintendent. Mine is opened by shaft and tunnel, showing ores carrying gold, silver, copper and lead values.

HAPPY JOHN MINE.**BRITISH COLUMBIA.**

Mine office Alberni, Vancouver Island, B. C. Property adjoins the Monitor mine on the west, and is said to have a promising ore body carrying gold, silver and copper values. Did 175' of tunneling in 1904.

HARDSCRABBLE MINES.**NEW MEXICO.**

Office and mine: Magdalena, Socorro Co., N. M. W. A. Brown, lessee. A. C. Thomas, superintendent; Ed Brittonstone, mine superintendent. Property shows 9 veins, occurring as fissures in granite and as contacts between granite and limestone, these being claimed to average about 25' width and to average about 4% copper, 30% lead, 44% zinc, 12 oz. silver and \$1 gold per ton, from cerussite, sphalerite and chalcopryrite. Mines have a 200' shaft and several tunnels, longest 200' and 300', estimated to show 20,000 tons of ore, with 12,000 tons blocked out for stoping. Employs 40 to 50 men.

OTTO HARNECKER.**CHILE.**

Office and mine: La Ligua, Aconcagua, Chile. Property is the Peña Blanca mine, opened 1888, making the equivalent of about 150 tons of refined copper yearly. Has a small matting furnace.

HARRINGTON MINING CO.**ARIZONA.**

Mine office: Crown King, Yavapai Co., Ariz. Geo. P. Harrington, general manager. Operates the Tiger mine, producing ores of gold, silver and copper. Has steam power and employed about 20 men at last accounts.

HARTFORD CONSOLIDATED COPPER CO.**CALIFORNIA.**

Lands, 10 claims, 3 miles north of Protem Creek, Shasta Co., Cal., carrying an 8' vein showing oxidized ores on surface, with a limited quantity of disseminated sulphides, developed by 400' of tunnels.

HARTFORD COPPER & GOLD MINING CO.**IDAHO & ALASKA.**

Office: 7 Exchange pl., Boston, Mass. Mine office: Challis, Custer Co., Idaho. Capitalization \$2,000,000. Henry J. Wilkins, president; Chas. M. Thayer, secretary; John I. Minear, mine manager. Idaho property is 150 miles from a railroad, but is quite extensively developed, having about one mile of tunnels and drifts, longest tunnel being 900'. Has a 50-ton mill, working on low-grade ore, and ships some high-grade smelting ore, running \$400 to \$600 per ton. Also owns copper and gold claims on Prince of Wales Island, Alaska. Was paying quarterly dividends of 1% at last accounts. Company apparently is paying dividends and selling stock simultaneously, which always is a danger signal to prudent investors.

HARVARD MINE.**ARIZONA.**

Mine office: Gilbert, Yavapai Co., Ariz. W. P. Hamlin, et al., owners; W. J. Gilbert, superintendent, at last accounts. Ores carry gold, silver and copper. Has gasoline power.

HATASA MINE.**JAPAN.**

Mine office: Hatasa-mura, Gugo-gori, Mino, Japan. An old property, opened previous to A. D. 1600, and once highly productive. Has 4 principal veins only 3" to 2' in width, carrying argentiferous copper and lead ores, associated with sphalerite, iron pyrites, etc. Production in 1900 was 165,416 momme of silver and 38,651 lbs. refined copper.

HATHAWAY MINE.**MEXICO.**

Mine office: Santo Domingo, Chihuahua, Mex. Lands, 18 miles south of Santo Domingo, show 2 small but persistent veins carrying rich sulphide ores. Has an old smelter, not in blast, and ships concentrates about 600 miles, to Aguascalientes, for reduction.

HATTIE GOLD AND COPPER MINING CO.**IDAHO.**

Letter returned unclaimed from former mine office, Doniphan, Blaine Co., Idaho.

HATTIE BELL COPPER, GOLD & NICKEL MINING CO.**ONTARIO.**

Property sold to Consolidated Copper Co. of Parry Sound.

HAWKEYE MINE.**OREGON.**

Mine office: Comer, Grant Co., Ore. Byron Sherbindy, owner and manager. Ores carry copper, gold and silver. Has a small smelter and employed 15 to 25 men at last accounts.

HAWKEYE COPPER MINING CO.**WYOMING.**

Office: 519 Equitable Bldg., Denver, Colo. Letter returned unclaimed from former mine office, Encampment, Carbon Co., Wyo. Joseph A. Michel, president and treasurer; Geo. C. Waterman, secretary. Organized 1900, under laws of Wyoming, with capitalization \$500,000, shares \$1 par. Lands, 2 claims, area 40 acres, having a 35' shaft.

HAWKSWORTH COPPER CO.**ARIZONA.**

Said to have 25 claims in vicinity of Agua Caliente, Maricopa Co., Arizona.

HAYFORD MINE.**ENGLAND.**

Offices: 150, Leadenhall St., London, E. C., Eng. Letter returned unclaimed from former mine office, St. Ives, Cornwall, England, marked "unknown."

HAYMAN MINING & TUNNEL CO.**COLORADO.**

Has a copper-lead property in the Lower Tarryall camp, Park county, about 25 miles northwest of Cripple Creek, Teller county, Colorado.

HEADLIGHT COPPER MINING CO.**WYOMING.**

Office and mine: Encampment, Carbon Co., Wyo. Chas. A. Finley, president; Philip Lee, secretary. Lands, 180 acres. Ore is low-grade. Idle.

HEADLIGHT GOLD MINING & MILLING CO.**COLORADO.**

Mine office: Spencer, Gunnison Co., Colo. L. C. Ehbeding, superintendent. Ores carry gold, silver and copper. Has steam power.

HEALDSBURG LODGE.**CALIFORNIA.**

Office: care of J. G. Caldwell, manager, Healdsburg, Sonoma Co., Cal. Lands, 1 claim, 10 miles north of Healdsburg. Property opened, circa 1885, by tunnel.

HEART OF ARIZONA GOLD & COPPER CO.**ARIZONA.**

Office: 203 Chamber of Commerce, Detroit, Mich. Mine office: Prescott, Yavapai Co., Ariz. Organized 1902, under laws of Arizona, with capitalization \$1,000,000. Presumably idle.

HEATH MINING CO.**IDAHO.**

Mine office: Heath, Washington Co., Idaho. R. T. Wolliston, superintendent. Ores carry gold, silver and copper. Has steam, water and electric power.

HECLA MINES.**WASHINGTON.**

Office: care of F. Danel, 217 Columbia St., Seattle, King Co., Wash. Lands, sundry claims in vicinity of Seattle. Idle at last accounts.

HECLA MINING CO.**WYOMING.**

Office: 404 Kittredge Bldg., Denver, Colo. Mine office: Hecla, Laramie Co., Wyo. Formed October, 1904, with capitalization \$1,000,000, shares \$1 par, as a reorganization of the Hecla Copper & Gold Mining, Milling & Smelting Co. Henry Schwartz, president and general manager; Geo. C. Norris, vice-president; Louis Williams, secretary; Thomas H. O'Reilly, mine superintendent. Lands, 405 acres, 40 patented, including the town-site of Hecla, 5 miles from a railroad, in the Silver Crown district, showing 16 fissure veins averaging 8' width, in schist and granite, of which 3 are being developed, these averaging 7' width and giving average assays of 5% copper and 3 oz. silver per ton, in addition to which they carry estimated average values of \$10 to \$12 per ton in nickel, platinum and uranium. Ores are oxides, carbonates and sulphides, opened by a 40' tunnel and 14 shafts of 10' to 140' depth. Has steam power, 15-stamp mill and 50-ton concentrator and leaching plant, in a building 80x100'. The Ohly process has been installed, with a view to saving the rare metals in the ore, and the company plans building a small smelter during 1905. Management of the company is regarded as experienced and honest, and property is considered promising

HECLA CONSOLIDATED MINING CO.**MONTANA.**

Office: Indianapolis, Ind. Mine office: Dillon, Beaverhead Co., Mont. Henry Knippenberg, president and general manager. Property includes the Atlantis, Cleve and other mines, carrying ores of gold, silver, lead and copper and producing about 100,000 lbs. of copper yearly, as a by-product when operated. Idle at last accounts, but reorganization of company and resumption of operations planned.

HECLA COPPER MINING CO.**WYOMING.**

Letters returned unclaimed from former office, Manistee, Mich., and former mine office, Encampment, Carbon Co., Wyo. Once held 4 claims, area about 30 acres, adjoining the Kurtz-Chatterton, in the Encampment district.

HECLA COPPER & GOLD MINING, MILLING & SMELTING CO.**WYOMING.**

Reorganized, October, 1904, as Hecla Mining Co.

HECLA & ARIZONA DEVELOPMENT CO.**ARIZONA.**

Title changed, 1903, to Red Jacket & Bisbee Development Co.

HECLA & ARIZONA GOLD & COPPER MINING CO.**ARIZONA.**

Incorporated, 1902, by J. M. Carroll, of Weatherford, Texas, et al.

GEWERKSCHAFT HEDWIGSLÜCK.**GERMANY.**

Office: Düsseldorf, Germany. Mine office: Rheinbach, Kreis Bruhl-Unkel, Rheinprovinz, Germany. Lands, 4,377,708 square metres. Has copper, lead and zinc ores, developed by 2 shafts.

HELEN MINING CO.**NEW MEXICO.**

Mine office: Graham, Socorro Co., N. M. Thos. Graham, president. Property is the Confidence group, ores of which carry gold, silver and copper. Has a 30-stamp mill, and is equipped with steam, water and electric power. Employs about 75 men.

HELGA GOLD & COPPER CO.**BRITISH COLUMBIA.**

Mine office: Clayoquot, Vancouver Isld., B. C. Property is the Good Hope group, on Trout river. Was developing by tunnel, with force of 8 men, at last accounts, and is said to have secured a fair showing of ore.

HELSINGBORG'S KOPPARVERK.**SWEDEN.**

In Malmöhus Län, Sweden. Made 647,884 kilograms of cement copper, averaging 75.5% fine, and 1,166 kilograms of silver precipitate, averaging 5.2% fine, in 1901.

HELVETIA COPPER CO.**ARIZONA.**

Office: 27 State St., Boston, Mass. Mine office: Helvetia, Pima Co., Ariz. Incorporated March 3, 1899, under laws of New Jersey, with capitalization \$5,000,000, shares \$25 par; issued, \$3,750,000. Annual meeting, third Wednesday in February. Wm. A. Paine, president; Frederic Stanwood, vice-president; Fred B. Close, general manager; Old Colony Trust Co., of Boston, transfer agent. Lands, 55 patented claims, area 1,100 acres, also 900 acres miscellaneous lands, in the Santa Rita Mountains, 35 miles southeast of Tucson. Formation greatly resembles that at Bisbee, the carboniferous limestone strata being of the same geological horizon, with

similar porphyritic intrusions, but showing much stronger outcrops and goossans. The mine made an exceptionally fine showing from a depth of 35', but ores turned to sulphides on the third level, the base ores averaging under 5% copper. Main shaft is the Isle Royale, 600' deep, which should be sunk to a depth of at least 1,000'. Mine has 1,940' of shafts, 15,688' of tunnels and drifts and 5,200' of open-cuts. Machinery includes gasoline hoists and one steam and one gasoline air compressor. Nearest railroad station is about 16 miles distant, at Vail, on the Southern Pacific. A 2¼-mile private railroad line connects the mine and smelter. First smelter was burned in 1900 and rebuilt in 1901, present plant having a daily capacity of 150 tons. Mine made about 1,000,000 lbs. of refined copper in 1901, largest production being at the rate of about 200,000 lbs. monthly. Has smelted 26,892 tons of ore, giving average returns of \$14.47 per ton. The advisability of installing a leaching plant has been given consideration. Property is now in the hands of the Michigan & Arizona Development Co., on terms explained in description of that company.

HENRIETTA MINE.**ARIZONA.**

Owned and operated by Braganza Gold Mining Co.

HENSON CREEK LEAD MINES CO.**COLORADO.**

Office: 15 Court St., Boston, Mass. Mine office: Lake City, Hinsdale Co., Colo. C. E. Whiting, president; P. T. Newitt, superintendent. Property includes the Bonanza, Magnolia and other mines, carrying ores of gold, silver, lead and copper. Has water and electric power and a 50-ton concentrator, employing about 40 men.

MINAS HERCULES y OTRAS.**CHILE.**

Mine office: Taltal, Antofagasta, Chile. Henri Hintze, owner and manager. Mines include the Hercules, Silesia and Inesperada, which are producers of gold and copper ore. Have steam power and 4 Chilean mills, employing about 100 men.

HERCULES CONSOLIDATED MINING CO.**COLORADO.**

Mine office: Silverton, San Juan Co., Colo. Thos. H. Kane, superintendent. Mines cupriferous gold and silver ores, and has a 40-stamp mill.

HERCULES GOLD & COPPER CO.**NORTH CAROLINA.**

Office: 81 Fulton St., New York. Mine office: Cid, Davidson Co., N. C. Employs about 100 men. Organized May, 1901, under laws of South Dakota, with capitalization \$1,000,000, shares \$1 par. Wm. A. Anderson, president; H. L. Prentice, vice-president; R. E. Nuese, secretary; Saml. G. W. Brown, treasurer and general manager; Walter Cockreham, superintendent; John Jackson, mine superintendent. Lands, about 1,000 acres owned in fee and 1,300 acres held under contract, in Davidson county, including the Emmons mine, opened before the American Civil War. Lands show 3 fissure veins, ranging 18" to 15' in width, giving average assays of 7% copper, 2 oz. to 17 oz. silver and \$1.50 to \$15 gold per ton, from melaconite, bornite and chalcopyrite, mainly the latter. Is opened by shafts of 90', 140', 310' and 510' and by 4 tunnels, two of 100' each, one of 1,500' and one of 2,500', estimated to show about 65,000 tons of ore blocked out

for stoping. Has a 600-h. p. steam and electric plant, including 4 hoists good for depth of 1,000' each, a 20-drill Clayton duplex air compressor, 16 power drills, etc. Buildings include a 30x40' smithy, 60x80' shafthouse, 16x24' compressor house and 12 dwellings, with 40x64' shafthouse building at the North shaft. Has a 10-stamp mill with 100 tons daily capacity and is erecting a 30x60' concentrator, to be completed April, 1904. Has a smelter with 150-ton Allis-Chalmers water-jacket furnace, 1,000' from the main shaft, fully equipped and to be blown in when the concentrator goes into commission. Nearest railway, 14 miles. Has on the dumps several thousand tons of high-grade ore extracted in development. Company is well managed and has been developed along intelligent lines. Property is regarded as one of the most advanced and promising in the Appalachian field.

HERCULES MINING CO.**WYOMING.**

Office: 523 Bee Bldg., Omaha, Neb. Capitalization \$1,000,000, shares \$1 par. C. M. Jacques, president and general manager; J. E. Thatcher, secretary and treasurer. Lands, 4 claims, area about 80 acres, showing fissure veins of 9' average width, giving assay values of 5% to 49% copper from carbonate and sulphide ores. Main shaft, 280', also a 90' tunnel. Has steam and gasoline power. Idle.

HERKULES FRISCHGLÜCK-STOLLN UND KIESELS**GERMANY.****HOFFNUNG ERBSTOLLN.**

Office: care of E. R. Poller, Johanngeorgestadt, Saxony, Germany. Ores are sphalerite and chalcopyrite.

HERMINA MINING CO., LTD.**ONTARIO.**

Office: Calumet, Mich. Mine office: Massey station, Algoma, Ont. Employs 28 men. Organized 1903, under laws of Ontario, with capitalization \$2,500,000, shares \$5 par; issued, \$400,000. Joseph Hermann, president; Wm. H. Greene, vice-president; H. Appleton, secretary; Wm. B. Anderson, treasurer; preceding officers: Paul P. Roehm, Edward L. Ulseth, H. E. Lean and Peter Primeau, directors; Edward L. Hermann, superintendent.

Lands, 1,240 acres, held on bond and lease, in Salter township, showing 3 contact veins between diorite and quartzite, these standing nearly vertically with dip of about 85°, and having average widths of 5', 7' and 24', and traceable upwards of 2 miles. Ores are exclusively sulphide, mainly chalcopyrite, said by company to average 10% copper, 4 oz. silver and \$2.60 gold per ton. Development is by a 220' tunnel and 250' shaft, with 2 other shafts of 24' and 30'.

Equipment includes a 75-h. p. steam plant, with 45-h. p. hoist good for 700' depth, 5-drill Ingersoll-Sergeant air compressor, 3 rock drills, 31x40' machine shop, smithy and carpenter shops 20x30' each, office, boarding-house, barn and 9 dwellings. A large water-power, estimated by company as capable of developing 15,000-h. p., is available for future harnessing. Company plans sinking No. 1 shaft to depth of 700' and equipping No. 3 for deep sinking. Management hopes to put mine in shape to produce 150 tons daily before end of 1905, and in all likelihood the ore, when production

is started, will be smelted at the Victoria works of the Mond Nickel Co., only 40 miles distant. Management is honest and property is regarded as of considerable promise.

HERMIT GOLD & COPPER MINING & SMELTING CO. ARIZONA.

Organized 1904, under laws of Utah, with capitalization \$100,000, shares 10 cents par. J. W. Lee, president; Edwin W. Lee, treasurer; F. J. Barber, secretary. Lands are the Hermit group in Coconino county, Arizona.

HERMIT LAKE COPPER CO. COLORADO.

Office: 31 Milk St., Boston, Mass. Mine office: Silver Cliff, Custer Co., Colo. Organized 1899, under laws of Maine, with capitalization \$2,000,000, shares \$20 par. John H. Norton, president; Oliver J. Kimball, secretary; W. S. Elmendorf, superintendent. Ores carry gold and copper. Has water power and 20-stamp mill, employing about 25 men at last accounts.

MINA LAS HERRERIAS. SPAIN.

Operated by Bede Metal & Chemical Co., Ltd.

HESPERUS GOLD & COPPER MINES CO. BRITISH COLUMBIA.

Office: Chicago, Ill. Mine office: Grand Forks, B. C. Chas. J. Magee, president; S. P. Brannan, secretary; T. H. Rae, managing director. Organized 1903, with capitalization \$1,000,000, shares \$1 par. Property is the Betts, Hesperus, Lancaster and Chicago claims, on Hardy Mountain, about 4 miles from Grand Forks, developed by several hundred feet of cross-cuts and shafts showing promising bodies of self-fluxing sulphide ore. No. 2 tunnel is planned to be driven 600'. Work was continued steadily during 1904.

HETTA MOUNTAIN GROUP. ALASKA.

Lands, 8 claims, near Copper Harbor, Prince of Wales Island, Alaska, in north latitude 59°. Is asserted that property has a vein 2' to 20' wide and 3,000' long, averaging 10% copper, 3 oz. silver and \$2 gold per ton.

HETTIE GREEN GROUP. BRITISH COLUMBIA.

Office and mine: care of James Thompson, owner, Alberni, B. C. Lands, on Tranquil Creek, Bear River district, Clayoquot division, have had considerable development work and give a fair showing of chalcopryite, with occasional bornite.

HIBBE GOLD & COPPER MINING CO. CALIFORNIA.

Office: Sheridan, Cal. Organized 1903, with capitalization \$75,000, to operate in Hibbe county, California. N. H. Kaichner, president; Geo. Grutman, secretary and treasurer. Cannot be learned that any work is in progress.

HIBIRA MINE. JAPAN.

Mine office: Kitakata-mura, Higashi-Usuki-gori, Hyuga, Japan. An ancient mine carrying chalcopryite associated with iron pyrites, averaging 5% to 6% copper, in lenses lying in clay-slate and sandstone. Is a producer of importance, output for 1900 having been 1,769,498 lbs. refined copper.

J. F. HICKS & CO. TENNESSEE.

Mine office: Bristol, Sullivan Co., Tenn. Have copper claims, slightly developed. Idle.

HIDALGO MINING CO.**MEXICO.**

Letters returned unclaimed from former office, Douglas, Arizona, and former mine office, Nacosari, Sonora, Mexico.

HIDDEN TREASURE GROUP.**CALIFORNIA.**

Office and mine: care of Alger Bros., owners, Callahan, Siskiyou Co., Cal. Has a 100' tunnel on an 8' vein of disseminated ore with quartz gangue.

HIDDEN TREASURE MINING & MILLING CO.**WASHINGTON.**

Office: 27 Pacific Blk., Seattle, Wash. Mine office: Methow, Okanogan Co., Wash. Joseph West, treasurer and general manager. Organized 1896. Has a fissure vein of 2' to 4' width, with ore chutes of 8' to 10' width, traversing gneiss and carrying auriferous and argentiferous galena, sphalerite and chalcopryrite, with quartz and calcite gangue. Smelter shipment of 90 tons gave returns of \$67 per ton.

HIDDEN TREASURE MINING & TUNNELSITE CO.**WYOMING.**

Office: Lintoln, Neb. Mine office: Battle, Carbon Co., Wyo. H. M. Rice, manager. Has auriferous and argentiferous copper ores, opened by a long tunnel. Has water power and employs 10 to 15 men.

HIGASHIYAMA MINE.**JAPAN.**

Mine office: Higashiyama-mura, Oe-gori, Awa, Japan. Ore is chalcopryrite, associated with iron pyrites, occurring in lenses lying in quartz schist, and averaging 2% to 2.5% copper. Production in 1898 was 104,424 lbs. refined copper.

HIGGINS DEVELOPMENT CO.**ARIZONA.**

Office: 402 Equitable Bldg., Chicago, Ill. Mine office: Bisbee, Cochise Co., Ariz. Organized May 14, 1903, under laws of Arizona, with capitalization \$500,000, shares \$10 par. Nathan F. Leopold, president; J. H. Rice, vice-president; A. F. Leopold, secretary; Jas. R. Dee, treasurer; Scott Turner, superintendent. Property is the Higgins group of 11 claims, lying immediately northwest of the original openings of the Copper Queen mine, in Tombstone Canyon, Bisbee. Property is held under bond and lease of \$675,000, on which the first payment of \$100,000 was made in May, 1903. Payment falling due November, 1904, has been extended to May, 1905. Stock was issued \$5 paid, and two assessments of \$1 each have been levied since. Development is by shaft and two tunnels. Shaft, which is full working size, has 3 compartments and is 320' deep and very wet. The lower tunnel, 12' above the collar of the shaft, is 1,000' long and shows considerable hematite, with copper stains. The upper tunnel, 237' above the collar of the shaft, is 300' long, showing at a distance of 150' a convergence of several small fissure veins, with a narrow cave showing good copper values. Both tunnels are connected by a winze, and several small ore bodies have been cut at various points. Machinery includes a 10x14" duplex hoist, good for 2,000' depth, and a 6-drill air compressor.

HIGH HILL MINE.**VIRGINIA.**

Owned and operated by Virginia Copper Co., Ltd.

HIGHLAND BOY CONSOLIDATED MINING CO.**UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. J. W. Houston,

president; Clarence K. McCornick, secretary and treasurer. Lands, 54 acres, surrounded by the Utah Consolidated, Yampa, Boston Consolidated and other mines. Development is by a 2,600' tunnel, with about 4,000' of underground openings. Property regarded as decidedly valuable.

HIGHLAND BOY GOLD & COPPER MINING CO.

UTAH.

Stock owned by Utah Consolidated Mines Co.

HIGH LONESOME GOLD MINING & MILLING CO.

COLORADO.

Mine office: Coulter, Grant Co., Colo. Organized 1902, with capitalization \$500,000. Dr. W. E. Rammel, secretary and treasurer; E. S. Reardon, vice-president and superintendent. Claimed to have ore body, exposed by open-cut, 38' wide, assaying 18% to 21% copper and one-half oz. gold per ton.

HIGH ORE GOLD & COPPER MINING CO.

MONTANA.

Letter returned unclaimed from former mine office, Basin, Jefferson Co., Mont.

HIGH TOP COPPER MINING CO.

VIRGINIA.

Office: 1522-150 Nassau St., New York. Mine office: Elkton, Va. Employs about 125 men. Organized 1902, under laws of New Jersey, with capitalization \$5,000,000, shares 10 par. Morris D. Brown, president; Prentice W. Brown, secretary and treasurer; S. D. Brown, general manager; Robt. D. Crawford, mine superintendent. Lands, about 1,000 acres, owned in fee, in Greene county, Virginia, 7 miles from Norfolk & Western railroad. Has 3 wide fissure veins, traceable one mile, showing native copper and carbonate and sulphide ores, latter being estimated to contain average values of 6% copper, 10 oz. silver and \$15 gold per ton. Is worked open-cast, with steam power and a good mining equipment. In November, 1904, the company reported that the vein at the principal working point was more than 600' in width, opened by a 140' shaft and 50' drift.

MINA LA HIGUERA.

CHILE.

In vicinity of Coquimbo, Chile. Was a small producer at last accounts.

HILETA GOLD & SILVER MINING CO.

MEXICO.

Mine office: Velardeña, Durango, Mex. Carter Barker, manager. Lands, 32 pertenencias, area 89 acres, also 63 acres miscellaneous lands, adjoining the Velardeña mines. Country rocks are limestone and porphyry, showing 5 veins, one of which, opened by a 1,600' tunnel, with about 4,000' of underground openings, is about 12" width and 1,500' in length, carrying ores averaging 3% copper, 9% lead, 3% zinc, 60 oz. silver and \$30 gold per ton. Has steam and gasoline hoists and air compressor.

F. C. HILLS & CO.

SPAIN.

An English firm, operating the Castillo del Buitron mine.

HILLSIDE COPPER MINING CO.

NEVADA.

Office: 201 Exchange Bldg., Denver, Colo. Mine office: Pioche, Lincoln Co., Nev. Organized 1901, under laws of Nevada, with capitalization \$2,000,000, shares \$1 par. Wm. Gelder, president; M. E. Buffington, secretary; J. E. Gelder, treasurer. Lands, sundry mining claims in the Bristol district, including mines that formerly paid considerable dividends from silver-

lead ores, which at depth changed to silver-copper ores. Property regarded as valuable, but company is in bad shape financially. Idle.

HIMALAYA MINING CORPORATION, LTD.

INDIA.

Offices: Lenox House, Howard St., London, W. C., Eng. Sir W. H. D'Oyley, chairman. Registered March 7, 1902, with capitalization £30,000, to acquire the Rai copper mine, Kumaon Division, Northwest India. Cannot be learned that any mining work is in progress.

HIMMELFAHRT FUNDGRUBE.

GERMANY.

Office: care of Kgl. Sachs. Staatsfiskus, Dresden, Germany. Mine office: Freiberg, Saxony, Germany. Is owned and operated by the Saxon Crown. K. Stephan, manager. Ores carry silver, lead and copper, production of latter being very small. Employs 1,100 men.

HIRAKANE MINES.

JAPAN.

Mine office: Nibukawa, Rikuchu, Japan. T. Tokoyama, owner; S. Tsubouchi, superintendent. Ores carry silver and copper. Mines have steam and electric power, and smelter. Employ about 500 men.

HISAMUNE MINE.

JAPAN.

Mine office: Kawada, Oe-gori, Awa, Japan. A comparatively new property. Ore is chalcoppyrite, slightly argentiferous, and averaging 4% copper, occurring embedded in clay-amphibolite, beds ranging 2' to 5' in thickness. Output in 1899 was 112,196 lbs. refined copper.

HISANICHI MINE.

JAPAN.

Mine office: Nakagawa-mura, Senhoku-gori, Ugo, Japan. Ore is chalcoppyrite, associated with sphalerite and iron pyrites, all slightly argentiferous, in a vein in augite-andesite. Production for 1900 was 134,074 momme of silver and 566,268 lbs. refined copper.

HODGES HILL MINE.

NORTH CAROLINA.

An old and idle property in Guilford county, North Carolina. Ore is chalcoppyrite, with quartz gangue, in vein of 6' to 12' width.

HOFMAN CLAIMS.

CALIFORNIA.

Four claims, area 80 acres, near Ukiah, Lake Co., Cal., giving assays of 6% copper, \$5 gold and 2 oz. silver per ton, from carbonate and sulphide ores. Presumably idle.

HOFRET EL NAHAS MINES.

SUDAN.

In Southwest Kordofan, Anglo-Egyptian Sudan. Are worked in a small way to meet purely local demands, ore being smelted in a primitive manner at the mines.

HOGASHO MINE.

JAPAN.

Mine office: Hatayama-mura, Aki-gori, Tosa, Japan. Ore is chalcoppyrite, mixed with iron pyrites, averaging about 7% copper, occurring in lenses in country rocks of shale and sandstone, with intercalated red and green schalkstein. Production in 1900 was 138,032 lbs. refined copper.

GEWERKSCHAFT HOHENSTAUFEN.

GERMANY.

Office: Essen, Rheinprovinz, Germany. W. Brandenburg, president. Mine produces ores carrying zinc, lead and copper. Annual production is about 3,000 tons of ore, zinc values predominating.

HOKOISHI MINE.**JAPAN.**

Mine office: Kamo-mura, Nii-gori, Iyo, Japan. Ore is chalcopyrite mixed with iron pyrites, carrying 3.5% to 4% copper, in narrow veins averaging 1' width, occurring in chorite-amphibolite. Production for 1900 was 52,373 lbs. refined copper.

HOLDEN EXTENSION GOLD & COPPER MINING CO.**WASHINGTON.**

Mine office: Chelan, Chelan Co., Wash. W. J. Bowen, secretary and general manager. Capitalization, \$1,500,000. Lands, 2 claims, on the Holden lode, near Chelan.

HOLDEN GOLD & COPPER CO.**WASHINGTON.**

Mine office: Chelan, Chelan Co., Wash. J. H. Holden, president. Lands, 3 claims, area 60 acres, opened by 3 tunnels, longest 500', showing a vein of 40' to 54' width, carrying low-grade auriferous copper ores.

HOLLAND MINE.**ARIZONA.**

Mine office: Washington, Santa Cruz Co., Ariz. G. W. Crowe, superintendent. Ores carry copper, gold, silver, lead and zinc. Mine is opened by shaft and tunnel. Has steam power and small concentrator.

HOLLOWAY MINE.**VIRGINIA.**

Office: care of Alfred S. Wright, owner, 48 South Third St., Philadelphia, Pa. Mine office: Virgilina, Halifax Co., Virginia. Property is the old Hollcway or Eustis mine, 6 miles north of Virgilina, operated previous to American Civil War. Was bought of W. E. C. Eustis, Boston, by present owner, in 1904. Ores are sulphide, mainly chalcopyrite, carrying small gold and silver values. Shipped considerable ore to smelters at Norfolk, Va., circa 1900-1903. Present owner will continue development and give the property a thorough test during 1905.

HOLMES MINING & MILLING CO.**WISCONSIN.**

Office and mine: Mellen, Ashland Co., Wis. Organized 1902, under laws of Wisconsin, with capitalization \$150,000, shares 25c. par. C. A. Poundstone, president; John Holmes, vice-president; A. W. Peterson, secretary and general manager; Philip McDonald, superintendent. Lands, 80 acres, in the Penokee district, showing three veins carrying native copper, also sulphide copper ore assaying 30 oz. silver and \$3.70 gold per ton, with a little palladium, developed by a 140' shaft. Company does not pay its debts, and probably is moribund.

HOME COPPER CO.**ARIZONA.**

Office: and mine Morenci, Graham Co., Ariz. Organized April, 1901. Dr. A. M. Tuthill, president; R. H. Waugh, secretary and treasurer; N. L. Jenkins, superintendent. Lands, 35 claims, area circa 700 acres, in 2 groups, also a millsite on Eagle river. The Peacock group of 23 copper claims, about 1 mile southwest of Morenci, is opened by a 700' tunnel with a 500' back, a 150' tunnel and an 85' shaft. It is planned to sink a new shaft on the Will Do claim. Ores are carbonates and oxides, with some chalcocite, also a wide ledge of low-grade ore that is too lean for present working. The Buzzard Shadow group of 12 claims, across Gold Gulch, about 1 mile north of the Peacock group, shows a wide quartz vein with gold ore worth up to \$50 per ton, slightly developed by tunnel and shaft.

HOME COPPER CO.**WASHINGTON.**

Supposed to have claims near Cle-Elum, Kittitas County, Wash.

HOME COPPER MINING CO.**MICHIGAN.**

Lands, 240 acres, adjoin the Humboldt mine, in Keweenaw county, Michigan. Never a producer.

HOME COPPER MINING CO.**MONTANA.**

Disincorporated, 1903, with all debts paid.

HOME GOLD & COPPER CO.**NEW MEXICO.**

Office: Cooney, Socorro Co., N. M. Property is the Kat & Kittens group, on which a little good ore has been developed.

HOME GOLD & COPPER CO., LTD.**ONTARIO.**

Office: 90 Canada Life Bldg., Toronto, Ont. C. K. Miner, secretary and treasurer. Lands are sundry claims in Eastern and Western Ontario. Company also claims to have mineral lands in Nova Scotia and New Mexico. Has peddled its stock assiduously, and complains that previous editions of the Copper Handbook have done the company great injustice, but cannot be prevailed upon to furnish a detailed report. One Rufus L. Herrick, a pious agent for the company, sold stock by opening his office with prayer in the morning, and washing out free gold from quartz in the afternoon. Property idle and likely to remain so.

HOME RUN MINE.**WYOMING.**

Mine office: Rudefeha, Carbon Co., Wyo. Lands, sundry claims adjoining the Ferris-Haggarty mine of the Penn-Wyoming company. Idle at last accounts.

HOMESTAKE MINE.**ARIZONA.**

Mine office: Gilbert, Yavapai Co., Ariz. Chas. T aylor, superintendent. Ores carry gold and copper. Has gasoline power.

HOMESTAKE MINES, LTD.**BRITISH COLUMBIA.**

Mine office: Rossland, Yale district, B. C. Geo. H. Bayne, manager. Ores carry gold, silver and copper. Has steam power.

HOOSIER COPPER MINING & MILLING CO.**WYOMING.**

Office: Shelbyville, Ind. Letter returned unclaimed from former mine office, Encampment, Carbon Co., Wyo. Capitalization \$1,500,000, shares \$1 par; unissued, \$400,000. Lands, 9 claims, area 180 acres, developed by a shallow shaft and said to have a fair showing of medium-grade ore.

HORN SILVER MINING CO.**UTAH.**

Office: 52 Broadway, New York, N. Y. Mine office: Frisco, Beaver Co., Utah. Organized 1879, under laws of Utah, with capitalization \$10,000,000, shares \$25 par. Allan C. Washington, president; Juan M. Ceballos, vice-president; Ambrose I. Harrison, secretary and treasurer; Philo T. Farnsworth, manager. Produces gold, silver, lead, zinc and copper. Has a 30-stamp mill and employs 100 to 150 men. The Old Bonanza mine shows good values at a depth of 800', copper occurring mainly on the hanging-wall, with silver-lead ores favoring the foot-wall. Company lost \$20,698 on operations for 1902, ending the year with a surplus of \$66,750, but paid a \$20,000 dividend at close of 1903. Production of refined copper in 1902 was 717,353 pounds.

HORSE SHOE COPPER MINING CO.**ARIZONA.**

Dead. Former office, Park Row Bldg., New York. Lands, near Safford, Graham County, Arizona, have passed to another corporation. Ignatius L. Qualey, president; Frank S. Weller, secretary; Chas. Carbonelle, treasurer, "Baker Tom" Putnam and "Larry" Summerfield, alias Fred Herbert, all have been sentenced to the penitentiary for swindles connected with sales of stock of this company, their frauds being of a flagrant nature.

HORSESHOE GOLD MINING CO.**COLORADO.**

Mine office: Central City, Gilpin Co., Colo. N. H. Scheur, superintendent. Property is the Barnes mine, carrying ores of gold, silver and copper. Has steam power.

HORSFAL MINING CO.**COLORADO.**

Mine office: Gold Hill, Boulder Co., Colo. D. Wiggins, superintendent. Ores carry gold, silver and copper. Has steam power and employed about 15 men at last accounts.

HOUGHTON DEVELOPMENT CO.**ARIZONA.**

Office: Houghton, Mich. Mine office: Bisbee, Cochise Co., Arizona. Employs 20 men. Graham Pope, president; J. R. Cooper, vice-president; F. G. Coggin, secretary; W. B. McLaughlin, treasurer; Geo. C. Lawton, superintendent. Organized August 15, 1903, under laws of Arizona, with capitalization \$1,000,000, shares \$25 par; issued, 34,000 shares, \$5 paid in. Lands 13 claims, area 225 acres, in the Solomon Springs district, about 5 miles southeast of Bisbee. The surface showing, as is the case nearly everywhere in the Warren district, gives but small outcrops of ore, but geological conditions are favorable to the existence of large and profitable ore bodies at depth. Development is by 2 tunnels, the upper showing leached ground such as occurs near large bodies of copper ore elsewhere in the district. The lower tunnel, about 700' in length, has cut auriferous silver-lead ore of \$26 to \$55 value per ton, and it is hoped to find copper ore further on. Management is of the best and developments to date are of a rather encouraging nature.

HOULIHAN GOLD & COPPER MINING CO.**ARIZONA.**

Mine office: Jerome Junction, Yavapai Co., Ariz. J. T. Whedon, president; Geo. Houlihan, vice-president; Geo. C. West, secretary and treasurer. Has a 100' shaft, said to cut a 35' vein.

HOWARD COPPER CO.**MONTANA.**

Letter returned unclaimed from former office, 618 Broadway, New York. Mine office: Phillipsburg, Granite Co., Mont. Organized under laws of South Dakota, with capitalization \$1,500,000, shares \$1 par. Lyman N. Loomis, of Butte, Montana, president and treasurer. Lands, 60 acres, on which a little development work has been done. Title supposed to have been lost. President said to be an honest man, but company was promoted by Ralph M. Jacoby.

HOWARD MINING CO.**VIRGINIA.**

Mine office: Virgilina, Halifax Co., Va. C. N. Howard, general manager. Property is the Chappel mine, 10 miles from Virgilina and adjoining

the High Hill mine of the Virginia Copper Co., on the northeast, also a gold property about $4\frac{1}{2}$ miles north of Virgilina.

HOWE SOUND MINING CO.**BRITISH COLUMBIA.**

Office: care of Geo. H. Robinson, Vancouver, B. C. Organized under laws of Maine, with capitalization \$2,000,000, shares \$500 par, to take over the Britannia mine, on Howe Sound, British Columbia.

HOWELL MINES.**AUSTRALIA.**

Mine office: Howell, N. S. W., Australia. John Howell, manager. Property includes the Conrad mine, with a 250' main shaft, showing an ore body assaying 3% copper and 2 dwts. gold, with good tin values. Erection of smelter said to be contemplated.

HOWLE COPPER MINES.**ARIZONA.**

Mine office: Globe, Gila Co., Ariz. Idle.

HUACHUCA CONSOLIDATED DEVELOPMENT CO.**ARIZONA.**

Office: Bisbee, Ariz. Mine office: Palmerlee, Cochise Co., Ariz. Capitalization \$1,250,000, shares \$5 par. J. S. Palmerlee, president and general manager; Jas. G. Cowen, secretary; S. W. Clawson, treasurer. Lands, 24 claims, area 480 acres, in the Huachuca Mountains, about 25 miles west of Bisbee, opened by 2 tunnels and a 200' shaft, showing 8 parallel fissure veins of 3' to 28' width, carrying ore with quartz gangue assaying 3% copper, and up to \$28 gold per ton. Is to be reorganized as a mining company. Mine idle, pending installation of a 30-stamp mill. Management estimates that mine has developed 3 years supply at 75 tons per day of ore averaging \$9 per ton in values.

COMPAÑIA HUANCHACA DE BOLIVIA.**BOLIVIA.**

Offices: 29, Rue de Londres, Paris, France. Mine office: Pulacayo, Potosí, Bolivia. Organized 1873, under laws of Bolivia, and capitalization increased, 1877 and 1891, to 40,000,000 francs, shares £125 par. Prince Francisco de Argandoña de la Glorieta, chairman French board; Comte G. de Créqui Montfort, chairman Chilean board; Don Luis M. Solá, general manager; Segundo R. Nava, general secretary, Valparaiso, Chile; Jorge Lewis, agent, Antofagasta, Chile.

Property is silver and copper mines, former more important. The silver mines, area 3,300 acres, at Pulacayo, are large producers. The company also owns smelters at Huanchaca and Playa Blanca, latter leased to the American Smelting & Refining Co., under option to purchase, running to Oct. 30, 1907. Company has 600 miles of private telephone line, and operates the Antofagasta & Bolivia Railway, under lease.

HUBBARD-ELLIOTT COPPER MINES DEVELOPMENT**ALASKA.****CO., OF ALASKA.**

Office: 1115 Stock Exchange Bldg., Chicago, Ill. Western office: 411 New York Bk., Seattle, Wash. Organized under laws of Washington, with capitalization \$1,500,000. H. Curtis Elliott, president; Chas. G. Hubbard, vice-president and general manager; A. J. Elliott, secretary; John T. Evans, treasurer; J. P. Fay, general counsel. Lands, are sundry claims in

the Copper River district, inland circa 150 miles from Valdez, Alaska, supposed to be held under bond and lease, and developments, at last accounts, were confined to diamond drill borings.

HUDSON MINE.

COLORADO.

Mine office: Granite, Chaffee Co., Colo. W. H. Ball, superintendent. Ores carry gold, silver and copper.

HUELVA CENTRAL COPPER MINING CO., LTD.

SPAIN.

Voluntarily wound up.

HUELVA COPPER & SULPHUR MINES, LTD.

SPAIN.

Offices: 75, Constantine Road, London, N. W., Eng., and 17, Boulevard Haussmann, Paris, France. Mine office: Almonaster, Huelva, Spain. Organized Oct. 28, 1903, to take over the properties of the Huelva Central Copper Mining Co., Ltd., with capitalization £300,000, shares £1 par. Jules Claviez, managing director; G. D. Collas, secretary. Lands, 650 hectares, including the Cueva de la Mora and Monte Remero groups. Former company built a $4\frac{1}{2}$ kilometre railroad from the mines to Valdela-musa. Properties, which lie between the Rio Tinto and Tharsis mines, are considered valuable.

COMPAGNIE DES MINES DE CUIVRE DE HUELVA.

SPAIN.

Office: Brussels, Belgium. Mine office: La Granada, Huelva, Spain. Organized 1900, under laws of Belgium, with capitalization 1,000,000 francs. Don Pedro Melo y Novo, manager. Property is the Numancia, Sagunto and Taoro mines, carrying cupriferous iron pyrites. Idle.

HUERFANO GOLD & COPPER MINING CO.

COLORADO.

Organized under laws of Kentucky, to develop prospects near Ojo, in the Sierra Blanca district of Huerfano county, Colorado.

HUESCA COPPER, IRON & LEAD MINES, LTD.

SPAIN.

Offices: 49, Queen Victoria St., London, E. C., Eng. S. D. Cropper, secretary. Capitalization £50,000. Location of lands, if any, unknown.

HUINAC COPPER MINE, LTD.

Registered May 9, 1904, with capitalization £400,000, shares £1 par, without initial public issue. Location of lands, if any, unknown.

COMPANIA MINERA DE HUIRIACHIC.

MEXICO.

Mine office: Chalchihuites, Zacatecas, Mexico. John Stenner, president; C. A. Phelps, treasurer and general manager. Ores are argentiferous and auriferous chalcopyrite and galena, opened by shaft and tunnel. Employed about 75 men at last accounts.

HUMBER CONSOLIDATED MINING & MANUFACTURING CO.

NEWFOUNDLAND.

Office: 27 William St., New York. Mine office: York Harbour, Nfld. Organized Sept. 23, 1902, under laws of New Jersey, with capitalization \$1,200,000, shares \$100 par, in 2,000 shares of 8% preferred and 10,000 shares common stock. W. L. Holt, president; J. R. Williams, vice-president; E. W. Faucette, secretary and treasurer; C. E. Willis, managing director; H. V. Smythe, superintendent; S. J. Goodney, mining captain; Corporation Trust Co., New York, registrar and transfer agent.

Property is the old York Harbour mine, at Birchy Cove, Bay of Islands, Nfld., with 4 mining claims, area 6,400 acres, also 42 square miles, area 26,880 acres, of timber lands, giving total holdings of 33,280 acres, on the west coast of Newfoundland. Country rocks are diorite, ore occurring as fissure veins in serpentine, there being 12 known veins, of which 5 are undergoing development, widest ranging up to 50'. Veins show exclusively sulphide ores, apparently chalcopyrite only, carrying 3% to 18% copper, a little zinc, 0.5 oz. to 4 oz. silver, and 40 cents to \$1.40 gold per ton. Development is exclusively by shafts, of which there are 4, of 54', 64', 70' and 400', with about 2,000' of underground openings, showing about 100,000 tons of ore, with 50,000 tons blocked out for stoping.

The mine was discovered, circa 1870, but active development was not begun until 1900, and comparatively little was accomplished until property was taken over by present company, in 1902. Equipment includes a 250-h. p. steam plant with 5 hoists, 8-drill Norwalk air compressor, 8 power drills, engine-house, boiler-house, necessary mine buildings and 15 dwellings. Property has a crusher of 300 tons daily capacity, a sawmill and a substantial wharf on an excellent harbor, and is but 14 miles distant from the Newfoundland Railway. Mine and wharf are connected by a 5,000' tram-line with cable power. Company owns a powerful sea-going tug for towing rafts and carrying passengers and freight. Production for 1904 was about 15,000 tons of ore, exported to the United States. As much of the ore carries 50% to 52% sulphur, the mine is assured a steady market for a heavy tonnage, direct water transportation permitting cheap costs of delivery to any port on the Atlantic seaboard. The Humber is a strictly business proposition, with good management, and gives every promise of proving a success.

HUMBOLDT MINE.**NEW MEXICO.**

Office and mine: care of Schlosser & La France, owners, Fierro, Grant Co., New Mexico.

HUMBOLDT COPPER CO.**MICHIGAN.**

Office: 50 State St., Boston, Mass. Organized 1863, under laws of Michigan, with capitalization \$1,000,000, shares \$25 par. C. Howard Weston, president; John Brooks, secretary and treasurer. Lands are about midway between the Arnold and Phoenix mines, in Keweenaw Co., Mich. Has one shaft of 300' on the Arnold ashbed. Was opened 1853, and last exploratory work was done in 1901. About \$125,000 has been expended on the property, which never was a producer.

HUMBUG MINING CO.**UTAH.**

Mine office: Eureka, Juab Co., Utah. J. W. Roundy, superintendent. Ores carry gold, silver and copper. Has steam power and employed about 50 men at last accounts.

HUMMER GROUP.**CALIFORNIA.**

Office: care of Mischler & Rollins, owners, Callahan, Siskiyou Co., Cal. Ore occurs as irregular bodies of slightly nickeliferous chalcopyrite, disseminated in pyrrhotite.

HUNT MINING & MILLING CO.**IDAHO.**

Office: 8 India St., Boston Mass. Mine office: Weiser, Washington Co., Idaho. Idle.

HUNTER MINING CO.**WASHINGTON**

Jas. E. Blackwell, president. Said to have lands, somewhere in Washington, opened by shafts, tunnel and open-cut, showing a vein of 3' to 9' width giving average assay value of \$32 per ton, in gold, silver and copper.

HUNTER CREEK MINING & MILLING CO.

Alleged by shareholders to be a fraud.

HURON GOLD CO.**ARIZONA.**

Office: care of Geo. W. Hull, Jerome, Ariz. Owns the Swindler mine, near Huron, Yavapai county, Arizona.

HURON MINING CO.**WASHINGTON.**

Mine office: Darrington, Snohomish Co., Wash. L. H. Sawyer, superintendent. Ores carry copper and gold values. Has water power.

HUSSELMAN & SHAW GROUP.**CALIFORNIA.**

A group of 31 claims in the Moonlight Creek district, Lights Cañon, Plumas county, California. Was developing by tunnel at last accounts.

HUSTON MINE.**ONTARIO.**

Owned by J. J. Case, Cerro de Pasco, Perú, and 16 others. Lands, 1,400 acres, at Montgomery, 15 miles north of Thessalon, Algoma, Ont. Vein, 60' between walls, with 18' of payable ore assaying 8%, traced 3,000'. Vein stands up as a 40' bluff, and can be developed best by tunnels. Ore has quartz gangue, and can be concentrated to 20% copper or better. Property lacks rail transportation, and is undeveloped.

HYCO MINE.**VIRGINIA.**

An idle property, north of Virgilina, Halifax Co., Va. Fully described in Vol. II.

HYPOCKA MINING CO.**MONTANA.**

Mine office: Butte, Silver Bow Co., Mont. Organized 1902, with capitalization \$1,000,000, as a subsidiary corporation of the United Copper Co. Property is an undivided fifth interest in the Minnie Healey mine, other four-fifths of which are in litigation.

SOCIEDAD COLECTIVA IBARRA HERMANOS.**SPAIN.**

Offices: Sevilla. Spain. Mine office: Cortegana, Huelva, Spain. Don José Luis Buiza, engineer. Property is the San Telmo group of mines, formerly owned by Ibarra é Hijos, containing 29 old mines, area 222 hectares, carrying cupriferous iron pyrites. Property is undergoing development and supposedly is a small shipper.

ICONOCLAST CONSOLIDATED MINES CO.**WASHINGTON.**

Office: 412 Berlin Bldg., Tacoma, Wash. Mine office: Keller, Ferry Co., Wash. Is a consolidation of the Alliance Copper Mining Co. and the Iconoclast Gold & Copper Mining Co. Organized 1902, under laws of Washington, with capitalization \$2,500,000, shares \$1 par. J. R. Turner, president; C. E. Peterson, secretary; Alex. McMasters, superintendent; Robt. Young, engineer. Lands, 7 claims, area 115 acres, showing 3 contact veins, one

stated by company to be 150' wide and assaying 5% copper, 2 oz. silver and \$5 gold per ton from chalcopryrite. Main shaft, 325'; also 3 tunnels, with aggregate length of 514'. Has gasoline power.

ICONOCLAST GOLD & COPPER MINING CO. **WASHINGTON.**

Absorbed by Iconoclast Consolidated Mines Co. •

IDAHO CONSOLIDATED COPPER MINES CO. **IDAHO.**

Letter returned unclaimed from former office, 17 Park Row Bldg., New York. Mine office: Decorah, Washington Co., Idaho. Supposed also to have, or to have had, mineral holdings in vicinity of Wickenburg, Maricopa county, Arizona. Organized 1899, under laws of West Virginia, with capitalization \$1,000,000, shares \$10 par. C. F. Hathaway, president; J. M. Archer, secretary. A rather doubtful proposition.

IDAHO COPPER MINING & MILLING CO. **IDAHO.**

Office: 502 Andrus Bldg., Minneapolis, Minn. Chas. G. Carruthers, general manager, Colville, Wash. Lands, 160 acres, on the Salmon river, Idaho county, Idaho. Assays of surface ore said to give 30% to 40% copper. Presumably idle.

IDAHO MILLING CO. **IDAHO.**

Letter returned unclaimed from former mine office, Doniphan, Blaine, Co., Idaho.

IDAHO MINES CO. **IDAHO.**

Supposed to have been organized, 1904, by residents of Omaha, Neb., to develop copper claims in the Seven Devils district of Idaho.

IDEAL MINING & DEVELOPMENT CO. **ARIZONA.**

Owens the Gladstone mine, at McCabe, Yavapai county, Arizona, operated under lease by Cecil G. Fennell.

IKONOMOFF CESSION. **BULGARIA.**

Office: care of M. Dimitri Ikonomoff, owner, Hotel Boulevard, Sofia, Bulgaria. Mine office: Kara-Bair, Bourgos, Bulgaria. Property is held as a cession from the principality, and is in the development stage.

IKUNO MINES. **JAPAN.**

Operated by the Mitsu Bishi Gosschi Kwaisha.

ILLINOIS COPPER MINING CO. **WYOMING.**

Office: 862 Monadnock Blk., Chicago, Ill. Mine office: Encampment, Carbon Co., Wyo. Organized 1899, under laws of Wyoming, with capitalization \$1,000,000, shares \$1 par. Geo. H. Miller, president and general manager; N. V. S. Mallory, secretary and treasurer; Thos. R. Smith, superintendent. Lands, 9 claims, area 185 acres, in the Upper Platte district of Carbon county, showing 3 contact veins, principal said to be 18' wide, 50' deep and 4,500' long, carrying chalcocite in quartz gangue and assaying 14% to 27% copper, \$4 gold and 20 oz. silver per ton. Has 3 shafts, deepest 70'. Property has a good body of high-grade sulphide ore, and is considered promising.

ILLINOIS GOLD & COPPER MINING CO. **MEXICO.**

Letter returned unclaimed from former mine office, Panuco, Coahuila, Mexico. Property was Los Caballos mine, carrying gold-silver-copper ores.

MINA LA ILUSION.**MEXICO.**

Office: care of Dr. Augustin P. Gavilan, owner and manager, 4A, Calle de San Francisco, Durango, Mex. Mine office: Gabriel, Durango, Mex. Is a producer of gold, silver, lead, copper, zinc and mercury. Mine is opened by tunnels and employs about 40 men.

IMA CONSOLIDATED MINING & MILLING CO.**IDAHO.**

Mine office: Pattison, Idaho. Ores carry silver, gold and copper. Has steam power and 100-ton concentrator, employing about 60 men.

IMPERIAL COPPER CO.**ARIZONA.**

Offices: care of Development Company of America, 11 Pine St., New York, and Tombstone, Ariz. Mine office: Silver Bell, Pima Co., Ariz. Employs about 250 men. Organized May 15, 1903, under laws of Arizona. with capitalization \$500,000, shares \$10 par. Bonds, \$2,000,000 authorized; issued, \$1,271,800, at 6%. Balance sheet Dec. 31, 1904, gave liabilities of \$6,560,818.50, assets of \$7,839,480.24, with \$98,578.53 due company and \$71,061 cash on hand. Annual meeting, second Thursday in April. E. B. Gage, president; W. F. Staunton, vice-president and general manager; A. N. Gage, secretary and treasurer; preceding officers, H. M. Robinson and F. M. Murphy, directors; W. G. Barney, mine superintendent.

Lands, 60 claims, mostly patented, area circa 1,000 acres, also 2 sections for reduction works, with total holdings of about 3,000 acres, in the Silver Bell district. Property includes the Old Boot mine, now known as the Mammoth, opened circa 1865, which was a limited producer of high-grade copper and silver-lead ores, at irregular intervals, before bought by present company. Property is in the Silver Bell Mountains, a small independent range, at an elevation of 2,900' above sea-level. These mountains have granitic bases with limestone and quartzite cappings, latter much eroded and entirely gone at many points. There has been much faulting and shearing, ore bodies occurring as irregular lenses with axes parallel to fault and fissure planes, and having a northwesterly strike. The granite-porphyry in the vicinity of the lenses, occurring mainly at the lime-porphyry contacts, is strongly mineralized with copper sulphides. Eruptive dikes of diorite are highly altered, and the ore bodies have strong gossan cappings. The geology of the Silver Bell Mountains is typical of some of the best Arizona copper fields, and is of a highly promising nature.

The oxidized zone is comparatively shallow, not extending below 150' from surface in the principal workings. There is a sharp change from the oxidized to the unaltered zone. The upper ores are mainly cuprite, malachite and azurite, which have furnished the bulk of past production, while the ores below the water level are mainly chalcopyrite, with occasional bornite. The mines also show considerable cupriferous silver-lead ore, much of which is an intimate mixture of galena, sphalerite and chalcopyrite, decidedly difficult of satisfactory reduction.

Development is by the 600' Gage crosscut tunnel and two shafts. The Old Boot mine, now called the Mammoth, was opened by an incline shaft to a vertical depth of about 400'. This has been replaced by a 500', two-

compartment vertical shaft, known as the Mammoth, and the old shaft will be used solely for ventilation and pump-columns. The 2-compartment Union shaft is 350' in depth, and the mine has about 1,200' of underground openings, developing a considerable quantity of ore carrying average values of 12% copper, and 2 oz. silver per ton, with a trace of gold.

The mine has a 450-h. p. steam plant, with 5 hoists, ranging in size up to 200-h. p., good for 1,000' depth. Equipment includes 2 two-stage Norwalk air compressors of 10-drill capacity each, 15 power drills, 30x80' machine shop of wood sheathed with corrugated iron, 30x40' carpenter shop, 20x50' smithy, store, bunk-houses, boarding houses, changing houses, and 20 dwellings. The property includes an old 100-ton matting furnace, 1¼ miles from the mine, which probably will not be used at all, unless rebuilt, modernized and greatly enlarged. In order to secure rail connection with the Southern Pacific, the Imperial company has built the standard-gauge Arizona Southern Railway, 21 miles in length, from Silver Bell to Redrock, equipped with 2 locomotives and 5 cars.

Production was begun Sept. 7, 1904, by the shipment of selected high-grade ores to the Copper Queen smelter, at Douglas, and the product for 1904 was 3,030,632 lbs. fine copper, and 21,525 oz. silver, or at the rate of about 10,000,000 lbs. yearly. Large quantities of low and medium grade ores have been exposed, but these necessarily will require concentration before smelting. The company will continue active development work during 1905, and plans installing a 30-drill air compressor and electric pumps. It also is planned to begin the construction of large reduction works this year. The plant will be located at Redrock, and will include a large concentrator and smelter, probably of about 500 tons daily capacity, so built that it can be increased in size at a minimum outlay of time and money.

The Imperial Copper Co. has the same management as the Tombstone Consolidated Co., which is composed of experienced, successful and capable mining men and capitalists. The property is being well handled, and gives promise of making a very large and profitable mine, though several years will be required to develop the mine and bring the reduction plant to the full productive capacity of the property.

IMPERIAL COPPER CO.

ONTARIO.

Letter returned unclaimed from former office, Duluth, Minn. Organized November, 1899, to exploit bornite ore deposits in the Parry Sound district of Ontario.

IMPERIAL COPPER & GOLD MINING CO.

WYOMING.

Mine office: Encampment, Carbon Co., Wyo. M. F. Whalen, supt.

IMPERIAL COPPER MINING CO.

CALIFORNIA.

Mine office: Pollasky, Fresno Co., Cal. Property is the Painter mine, showing a vein of 4' to 7' width, traversing diabase and amphibolite schist, and carrying oxidized ores averaging 15% copper, in gangue of talcose schist. Has 3 shafts, deepest 110'. Idle.

IMPERIAL COPPER MINING CO.

UTAH.

Office: 205 La Salle St., Chicago, Ill. Mine office; Frisco, Beaver Co.,

Utah. Capitalization \$6,000,000, shares, \$10 par. A. B. Lewis, president and general manager; C. F. Haynes, secretary and treasurer; Frank X. Pellier, superintendent. Lands are about 400 acres, including the Comet and other groups, in the neighborhood of the Horn Silver and Majestic mines. Ores carry copper, gold and silver, and smelter shipments, made circa 1901, gave returns of 15% copper, with good gold and silver values. Is developed by tunnels, longest 1,200'. Has carbonate ores above, and sulphides below, which have given assays of 15% lead, 30% copper, 18 oz. silver and \$1 to \$9 gold per ton. Property is well located, and regarded as valuable, but at last accounts was considerably plastered with labor liens.

IMPERIAL GOLD & COPPER MINING CO.**UTAH.**

Office: Dooly Block, Salt Lake City, Utah. Is a dead beat.

IMPERIAL MINING CO.**WASHINGTON.**

Office: care of Jas. E. Dupree, president, Marysville, Wash. Mine office: Silverton, Snohomish Co., Wash. M. Swinnerton, superintendent. Lands, 11 claims, showing a contact vein between diorite and conglomerate, ores carrying gold, silver, copper and lead.

IMPERIAL MONTANA COPPER MINING, SMELTING**MONTANA.****& WATER POWER CO.**

Offices: 271 Broadway, New York, and Helena, Mont. Mine office: Blackfoot, Teton Co., Mont. Organized March 8, 1901, under laws of Arizona, with capitalization \$10,000,000, shares \$10 par. James B. Holmes, president and general manager; J. H. Calderhead, vice-president; Oliver M. Holmes, treasurer. Lands, 19 claims, on which more or less development work has been done. Management seems honest and well-intentioned, but company has suffered from scarcity of funds almost since birth, and prospects do not seem bright.

IMPERIAL PAINT & COPPER CO.**CALIFORNIA.**

Mine office: Spenceville, Nevada Co., Cal. Otto Woehler, superintendent. Mine is developed by an open cut, and has steam power.

INCA MINING & MILLING CO.**IDAHO.**

Office: Colfax, Washington Co., Idaho. Mine office: Cuprum, Washington Co., Idaho. M. O. Reid, superintendent. Property is the Mineral World mine, carrying auriferous and cupriferous silver-lead ores. Employed about 10 men at last accounts.

INDEPENDENCE COPPER & GOLD MINING CO.**UTAH.**

Office: care of E. O. Leatherwood, secretary-treasurer, Salt Lake City, Utah. Organized 1904, with capitalization \$50,000, shares 10 cents par. Chas. Park, president; E. R. Morgan, general manager. Lands, 7 claims, in the Little Cottonwood district of Salt Lake county.

INDEPENDENCE MINE.**MONTANA.**

A slightly developed property on the Tobacco Plains, near Kalispell, Flathead Co., Montana. Vain said to be 25' wide, showing 8% copper, and \$4 to \$10 gold and silver per ton. Idle.

INDEPENDENCE MINING CO.**COLORADO.**

Mine office: Turret, Chaffee Co., Colo. Ores carry copper and gold. Has steam power and employs about 15 men.

INDEPENDENCE MINING CO.**WYOMING.**

Mine office: Dillon, Wyo. Capitalization \$1,000,000, shares \$1 par. Formerly was the Leighton-Gentry Mining Co. E. W. Honchin, president and manager; H. O. Granberg, secretary and treasurer. Lands, sundry claims, with a contact vein, opened by 105' tunnel and 150' incline shaft, showing copper and iron sulphides carrying gold, nickel and cobalt. Is developing steadily, with a small force.

INDEPENDENCIA MINING CO.**MEXICO.**

Office: St. Paul, Minn. Mine office: Ameca, Jalisco, Mex. C. D. O'Brien, manager. Mine has argentiferous copper ores, developed by 300' shaft and 375' tunnel. Employed about 60 men at last accounts.

INDEPENDENT MINING CO.**WASHINGTON.**

Mine office: Baring, King Co., Wash. Berj. Evans, superintendent.

INDEX MINING CO.**WASHINGTON.**

Office: care of Lot Wilbur, president and general manager, Snohomish, Wash. Mine office: Index, Snohomish Co., Wash. Lands, 5 claims, showing 3 veins, one averaging 3', with paystreak on foot-wall carrying bornite and chalcocite, and said to give increased values at depth.

INDEX-BORNITE COPPER MINING CO.**WASHINGTON.**

Office: 36 Dexter Horton Bldg., Seattle, Wash. Mine office: Index, Snohomish Co., Wash. A. M. Watt, secretary and treasurer. Lands, about 3 miles from Index, show a 2' vein carrying bornite giving assays of 16% to 50% copper and 6 oz. to 8 oz. silver per ton.

INDEX-HORSESHOE COPPER MINES.**WASHINGTON.**

Office: care of F. Danel, 217 Columbia St., Seattle, Wash. Mine office: Index, Snohomish Co., Wash. A small and idle prospect.

INDEX-INDEPENDENT MINING CO.**WASHINGTON.**

Mine office: Index, Snohomish Co., Wash. Benj. Evans, superintendent. Lands; 3 claims, 5 miles southeast of Index, with about 1,000' of openings on a vein standing nearly vertically and traversing granite, carrying chalcopryite, chalcocite and bornite, with quartz gangue. A carload of ore smelted assayed \$98.98 per ton.

INDEX-PEACOCK COPPER MINES.**WASHINGTON.**

Office: care of F. Danel, 217 Columbia St., Seattle, Wash. Mine office: Index, Snohomish Co., Wash. A prospect on which a limited amount of development work has been done. Probably idle.

INDIAN GROUP COPPER CO.

Has disappeared from former office, 1016-25 Broad St., New York. S. M. Biddison was president.

INDIANA COPPER CO.**WYOMING.**

Mine office: Holmes, Albany Co., Wyo. Lands, 6 claims, near the Rambler mine.

INDIANA MINE.**MICHIGAN.**

A tract of 1,280 acres in Sections 21, 27 and 28, Town 51 North, Range 37 West, Ontonagon Co., Mich. Has 2 shafts, each of 180' depth. Owners spent \$200,000, circa 1862-1865. Idle many years.

INDIANA MINING CO.**OREGON.**

Office: 25 Decker Bldg., Anderson, Ind. Mine office: Medical Springs, Baker Co., Ore. Organized under laws of Oregon, with capitalization \$1,500,000. John W. Messner, president and general manager; J. W. McAlpine, vice-president; Dr. W. J. Stapish, treasurer; W. G. Drowley, secretary. Lands include 2 groups, known as the "Prairie Diggins" and Myers. Latter is sinking shaft and has installed a 500' hoist. The Prairie Diggins has considerable development and a small mill.

INDIANA-SONORA COPPER & MINING CO.**MEXICO.**

Property, now known as Sierra de Cobre, sold to Phelps, Dodge & Co.

INDIANAPOLIS COPPER MINING CO.**WYOMING.**

Mine office: Riverside, Carbon Co., Wyo. Lands, 14 claims, 6 miles southeast of Riverside. Has steam power. Presumably idle.

COMPANIA INGLESA DE MINAS.**CHILE.**

Mine office: Puquios, Copiapó, Atacama, Chile. Walter T. Holberton, agent. Has mines at Puquios and Copiapó.

COMPAGNIE D'INGUARAN.**MEXICO.**

Office: Paris, France. Mine office: Inguaran, Michoacan, Mex. J. L. Phillips, director. Capitalization, increased 1904 to 12,000,000 francs. Company is a close corporation, controlled by the French house of Rothschild, and gives out no information. A considerable amount of the company's capital stock is held by the Compagnie du Boleo. Employs about 300 men. Lands, 185 pertenencias, area 457 acres, of patented lands, and 5,000 pertenencias held under concession, in the Tacambara district. Price paid for undeveloped property was \$1,500,000, Mexican. Country rock is granite in several stages of alteration, capped by a silicious limestone of 200' to 300' thickness. Ores of the district range 1.5% to 65% copper, with 2 oz. to 100 oz. silver and from a trace up to 1 oz. gold per ton. Ores of the Inguaran are almost exclusively sulphide, the ore body, of immense size, carrying mainly disseminated chalcocite, associated with a little bornite and chalcopryite, with granite-porphry gangue, gold values being slight, but silver values considerable. Estimates of size and value of ore bodies vary greatly, but the best authorities give an estimated average value of 3.25% copper, with about 3,000,000 tons developed. The proven depth of the ore is about 300 metres, at which depth the ore body apparently cuts off. The ore is well suited for concentration, and it is planned to put about 8 or 10 tons into 1, before smelting. The mine is opened by a 2,500' tunnel and 2 main shafts, deepest 350', levels being opened every 80'. Both ore and country rock are exceedingly firm and the mine will require no timbering.

The Inguaran has steam power and about 200-h. p. at Mata de Plantano, 6¼ miles from the mine, developed from a stream with an available head of 930', flowing about 80 liters per second and fed by springs that burst forth from the foot of Mt. Jorullo, about 150 years ago, after the last eruption of that volcano.

The company has secured complete surveys and plans for building a rail-

road line of several hundred miles from the mines to Zihuatanejo, on the Pacific, north of Acapulco. The route of the proposed railroad traverses an exceedingly rugged country, and the line would require several years to construct. Surveys also have been made for a short line connecting the mines with the Uruapan branch of the Mexican National railway, which is about 75 kilometres distant.

Owing to its inaccessibility and the fact that the property is controlled by the Rothschilds, many misleading stories have been printed regarding the Inguaran, and the popularly accepted estimates of its richness, size and productive capacity are much exaggerated. The mine has a large body of low-grade ore and probably will make a considerable producer in time, but the quantity and quality of its ore are not equal to ores possessed by a number of other copper mines in Mexico. Development is proceeding very cautiously and slowly, and at rate of previous progress several years will be required to bring the Inguaran into the ranks of the producers.

INTERCOLONIAL COPPER CO.**NEW BRUNSWICK.**

Office: 702 Banigan Bldg., Providence, R. I. Mine office: Dorchester, Westmoreland Co., N. B. Organized 1899, under laws of Arizona, with capitalization \$2,500,000, shares \$10 par. Darius L. Goff, president; T. J. Edwards, secretary; Allan W. Chapman, general superintendent; Henry Carmichael, consulting engineer. Lands, 250 acres freehold and 1,100 acres leasehold held from the crown, showing a blanket vein carrying carbonate and sulphide ores, said to give returns of 3% to 4% copper. Has shafts of 40', 75', and 150', also a 1,500' drainage tunnel, with about 8,000' of underground openings. Has steam and electric power. The reduction plant includes a 200-ton concentrator, leaching plant and electrolytic refinery. Equipment includes 2 boilers, 4 engines, crusher, rolls, 15 tubular roasting furnaces, six 300-ton leaching vats and two 50-kw. dynamos. The electrolytic plant has 550 lead cathodes and 550 lead anodes, 22x33" each, giving a plating surface of 5,000 square feet, for the deposition of electrolytic copper. Plant also includes tanks for precipitation of metal in cuprous leachings on scrap iron. The reduction plant did not prove satisfactory, machinery, going wrong after the production of about 50 tons of refined copper. Company is out of funds and property idle.

INTERMOUNTAIN GOLD & COPPER MINING CO.**IDAHO.**

Mine office: Pocatello, Bannock Co., Idaho. G. B. Rogers, president; Frank Ball treasurer; G. A. Clark, secretary. Owns the Lost Horse group of claims on Ft. Hall Indian reservation, having a 50' shaft, said to be bottomed in good ore.

**INTERNATIONAL CONSOLIDATED SMELTING
& REDUCTION CO.****MEXICO.**

Office: care of Daugherty & Albers, 69 Wall St., New York. C. B. James, president; Jas. H. McKinnell, secretary and treasurer. Was organized Jan. 1, 1904, by merging of the Mexican Lead Co. and Guaynopa Smelting & Reduction Co. Lands of latter were 54 pertenencias, area 133 acres, in Guaynopa Cañon, district of Guerrero, Chihuahua, Mexico, showing ores

carrying 5% to 8% copper, with good silver values. Some reputable residents of El Paso, Texas, have allowed their names to be associated with that of Mr. James in this venture, and are hoping for the best.

INTERNATIONAL COPPER CO.

COLUMBIA.

Office: 71 Broadway, New York, N. Y. Mine office: Natagaima, Tolima, Columbia. Organized October, 1900, under Arizona laws, with capitalization \$1,000,000, shares \$1 par. Wm. R. Townsend, president; Arthur F. Carmody, vice-president; Wm. H. Martin, secretary and treasurer. Lands, 2,300 acres, near Natagaima, said to carry a good showing of copper, but it cannot be learned that any effort ever has been made to develop a mine thereon.

INTERNATIONAL COPPER CO.

UTAH.

Merged, 1903, in Dirigo-La Sal Gold & Copper Mining Co.

INTERNATIONAL COPPER CORPORATION, LTD. **NEW CALEDONIA.**

Property sold, 1900, to Caledonian Mining Corporation.

INTERNATIONAL COPPER MINING CO.

ARIZONA.

Office: P. O. Box 530, Hancock, Mich. Mine office: Bisbee, Cochise Co., Ariz. Organized May 18, 1903, under laws of Arizona, with capitalization \$3,000,000, shares \$10 par. Fred J. Bawden, president; Jas. R. Cooper, vice-president; R. Mount Beattie, secretary; Geo. H. Nichols, treasurer; Carl Clausen, general manager. Lands, 14 patented claims, near Solomon Springs, 6 miles southeast of Bisbee, in the Warren district. Idle.

INTERNATIONAL COPPER MINING & MILLING CO.

WYOMING.

Office: care of F. M. Dunn, Minneapolis, Minn. Mine office: Encampment, Carbon Co., Wyo. Presumably idle.

INTERNATIONAL COPPER & GOLD CO. **COLORADO, MONTANA, & MEXICO.**

Office: 1122-135 Adams St., Chicago, Ill. Organized 1899, under laws of Arizona, with capitalization \$3,000,000, shares \$1 par. Albert G. Beaunisme, president; A. B. Ballou, secretary and treasurer; W. C. Hermbuecher, general manager; Gad Freeman, superintendent. Lands, 149 claims, area about 400 acres, in Routt Co., Colorado; Madison and Missoula counties, Montana, and states of Sonora and Sinaloa, Mexico. Has shaft of 280' in Montana, and 60' shaft in Colorado. Ores are sulphide in Colorado, carbonate in Montana, and carbonate and oxide in Mexico.

Mexican properties, held under name of the Santa Fé Gold & Copper Mining Co., include La Josefita group, 50 pertenencias, in Sonora, near the Sinaloa line, said to show an 80' ore body giving assays of 25% to 28% copper, with good surface showing. It is planned to develop this group by quarrying. La Australia group of 20 claims, near El Fuerte, Sinaloa, is opened by a 70' two-compartment shaft showing a 1' pay-streak of bonanza ore, assaying 15% copper and 1,212 oz. silver per ton. La Sorteo group, 10 pertenencias, 7 miles from San Bernardo, has a 30' vein opened by a 150' tunnel, giving good assay values in gold, silver and copper. El Negro group, 14 pertenencias, carries gold and silver. The Piedregal group, 15 pertenencias, is a little east of El Negro. La Higuera group, 8 pertenencias, in Sonora shows a 16" pay-streak

in a 50' vein, carrying mainly silver values. El Niño group, 10 pertenencias, 30 miles southwest of San Bernardo, gives good assay values in gold, silver and lead. The Zacatecas group, of 10 pertenencias, carries gold.

Title to the Montana property is now in the Montana Copper & Gold Mining Co., stock of which is controlled by the International Copper & Gold Co. The Escalante group, in Routt county, Colorado, is undeveloped.

INTERNATIONAL GOLD & COPPER CO., LTD. ONTARIO.

Office: Mooney-Brisbane Bldg., Buffalo, N. Y. M. M. Wall, president; G. W. Stanley, treasurer; E. F. Goff, secretary; R. E. Erdman, superintendent. Organized under laws of Arizona, with capitalization \$3,000,000, shares \$1 par. Lands, sundry claims in the Hastings district of Frontenac county, Ontario, slightly developed by a 100' shaft.

INTERNATIONAL GOLD-COPPER MINING CO. BRITISH COLUMBIA.

Company lost its property, at Rossland, B. C., and stock is worthless.

INTERNATIONAL GOLD & COPPER MINING CO.

Office: 62 Commercial Blk., Salt Lake City, Utah.

INTERNATIONAL MINE.

MEXICO.

Office: care of H. E. Dugan & Co., owners, Douglas, Ariz. Lands, are sundry claims on the Nacozari railroad, Arizpe district, Sonora, about 15 miles south of Douglas, showing a 2' to 6' quartz vein carrying carbonate ores assaying 3% to 30% copper, 6 oz. silver and occasionally a little gold, developed by several shafts of 20' to 50' depth.

INTERNATIONAL MINE & INVESTMENT CO.

MEXICO.

Office: care of E. F. Fisher, secretary, Douglas, Arizona. Dr. W. E. Lindley, president; J. M. French, treasurer; S. C. Morrison, superintendent. Lands, 108 pertenencias, area 212 acres, adjoining the lands of the Santa Rosa Development Co., about 4 miles from the Nacozari railroad, in the Arizpe district of Sonora, Mexico. Lands show oxide and carbonate ores carrying good values in copper, lead and silver, with small gold values. Also owns sundry mineral lands in the Mulatos district of Sonora, about 200 miles south of Santa Rosa.

INTERNATIONAL MINING CO.

COLORADO.

Mine office: Black Hawk, Gilpin Co., Colo. Geo. F. Johnstone, manager. Ores carry gold, silver and copper. Has steam power.

INTERNATIONAL MINING CO., LTD.

ONTARIO.

Office: care of V. E. Metzger, secretary and treasurer, Sault St. Marie, Mich. C. S. Beadle, general manager. Lands, 1,400 acres, known as the Brady location, lying east of the Mississagua river, in Patton and Thompson townships, 30 miles east of Sault Ste Marie and 5 miles from Dean Lake station, Algoma, Ontario, opened by 12 test pits, deepest 24', showing a 3' vein carrying chalcopyrite assaying 5% to 28% copper, with small gold and silver values.

INTERNATIONAL MINING & REFINING CO.

CHILE.

Mine office: Chañaral, Atacama Chile. Operates a group of old mines at Chañaral, and also is opening mines in the Huantajaya district.

INTERNATIONAL NICKEL CO.

Office: 43 Exchange Place, New York. Organized March 30, 1902, under laws of New Jersey, with authorized capitalization \$24,000,000, shares \$100 par, half in 6% non-cumulative preferred and half in common stock; outstanding, \$8,741,506 preferred and same amount of common stock. Debentures, \$10,000,000 authorized, at 5%; issued, \$9,903,440. Ambrose Monnell, president; Col. R. M. Thompson, chairman executive committee; Stephen H. B. Bell, secretary.

Company is a securities holding corporation only, controlling, by stock ownership, the Canadian Copper Co., Vermilion Mining Co., Orford Copper Co., Anglo-American Iron Co., Nickel Corporation, Ltd., Société Minière Caledonienne and American Nickel Works at Camden, N. J.; also holds extensive stock interests in the Société le Nickel and other companies. Is commonly known as the Nickel Trust, and while not absolutely controlling the world's nickel supply, is the dominant power in that industry. Net earnings for the first year, ending March 31, 1903, were \$559,000, and for the fiscal year, ending March 31, 1904, gross earnings were \$966,225, and net earnings \$341,102.

INVESTORS MINING & POWER CO.**WYOMING.**

Office: care of C. T. Bergquist, P. O. Box, 132, Encampment, Wyo. Capitalization \$1,000,000. Lands, somewhere in Wyoming, are said to carry one mile on the strike of two promising copper veins.

IOWA-NEW MEXICO MINING CO.**NEW MEXICO.**

Supposed to have copper-gold claims on Turkey Creek, also at Scheher-ville, N. M., but letters returned unclaimed from both points.

IRIGOYEN HERMANOS y CA.**MEXICO.**

Mine office: Huetamo, Michoacan, Mex. Produced 48.9 metric tons of copper in 1902.

IRISH MINES.**ARIZONA.**

A group of 7 claims in the Greenlee district of Graham county, Arizona, said to show a vein of 10' to 15' width, showing oxides and altered sulphide ores carrying values up to 15% copper, slightly developed by a 100' tunnel.

IRONCLAD COPPER MINING CO.**OREGON.**

Office: care of Dr. P. L. Mackenzie, Portland, Ore. W. H. Warren, secretary. Lands, 10 claims, in St. Helen's district of Washington, on which 2 veins, giving average assay values of about \$25 per ton in copper, gold and silver, have been slightly developed.

IRON CROWN GROUP.**ALASKA.**

Promising claims in the vicinity of the Hetta Mountain group, near Copper Harbor, Prince of Wales Island, Alaska. Idle at last accounts.

IRON DYKE COPPER MINING CO.**OREGON.**

Office: Erie, Pa. Mine office: Carson, Union Co., Ore. Frank E. Pearse, superintendent. Lands are slightly developed by tunnel.

IRON FALLS GOLD & COPPER MINING CO.

Letters returned from former office, 713 New York Blk., Seattle, Wash.

IRON HORSE MINING & MILLING CO.**ARIZONA.**

Mine office: Globe, Gila Co., Ariz. Organized 1904, with capitalization \$500,000.

IRON KING MINE.**ARIZONA.**

There are two Iron King copper mines in Yavapai county, Arizona. One is owned by the American Copper Co., the other by the Equator Mining & Smelting Co.

IRON KING EXTENSION MINING CO.**ARIZONA.**

Office: 66 Broadway, New York. Mine office: Carrollton, Yavapai Co., Ariz. A Douglass-Lacey promotion.

IRON MASK MINE.**BRITISH COLUMBIA.**

Operated by British Columbia Exploration, Ltd.

IRON MOUNTAIN COPPER CO.**UTAH.**

Said to be developing veins carrying copper, lead, gold and silver, 18 miles from Lund, Utah. Duncan J. Frew, superintendent, at last accounts.

ISABEL COPPER MINING CO.**WYOMING.**

Property sold, October, 1902, to Rambler Mining & Smelting Co.

MINA ISABEL.**MEXICO.**

Mine office: care of Jesus M. Celaya y Ca., Saric, Sonora, Mex. A copper prospect showing slight development.

ISHPEMING & BISBEE DEVELOPMENT CO., LTD.**ARIZONA.**

Attempted organization under this title, in 1903, not effected.

ISLAND CITY COPPER MINING CO.**WYOMING.**

Office: Eaton Rapids, Mich. Letter returned from former mine office, Saratoga, Carbon Co., Wyo. Presumably idle.

ISLAND MOUNTAIN CONSOLIDATED COPPER CO.**CALIFORNIA.**

Lands, 7 claims, in Trinity county, near the Mendocino county line, California, opened by a 490' tunnel and having several open-cuts, on a vein ranging up to 130' width and traced for about 800', capped by large boulders carrying copper and iron sulphides. Property considered promising.

ISLE ROYALE COPPER CO.**MICHIGAN.**

Office: 199 Washington St., Boston, Mass. Mine office: Houghton, Houghton Co., Mich. Employs about 400 men. Organized March, 1899, under laws of New Jersey, as a consolidation of the Isle Royale Consolidated Mining Company and the Miners' Copper Company, with capitalization \$3,750,000, shares \$25 par. Annual meeting, first Wednesday in April, at Jersey City. A. S. Bigelow, president; Edgar Buffum, vice-president; W. J. Ladd, secretary and treasurer; preceding officers, C. H. Bissell, and W. A. S. Chrimes, directors; Wm. E. Parnall, superintendent; H. D. Haddock, clerk; Ed. Colenso, chief mining captain; James E. Richards, surface superintendent; Jas. G. Glanville, mill superintendent. The Isle Royale company owns \$50,000 worth of stock in the Lake Superior Smelting Co.

Lands, 3,240 acres of mineral lands and an 80-acre millsite, including the old Isle Royale, Grand Portage and Huron mines, the Dodge and Frue prospects and sundry undeveloped lands, with an option on the mineral rights of the Montezuma tract of about 250 acres lying next west Lands

include all of Sections, 1, 2 and 11 and part of Sections 3, 9, 10 and 15, in T. 54 N., R 34 W., also 160 acres in 6-54-33; 40 acres in 31-55-33 and 160 acres in 36-55-34, giving a compact tract carrying about $2\frac{1}{2}$ miles on the strike of the lodes.

The three old mines included in the present Isle Royale tract made 24,226 tons, 590 lbs. refined copper, of which the Huron furnished 17,883 tons, 225 lbs., the Isle Royale 4,602 tons, 71 lbs., and the Grand Portage 1,741 tons, 294 lbs. These products were secured under primitive conditions and at a loss of about \$2,500,000. The old Isle Royale and Grand Portage mines were opened in 1853, and the Huron in 1855. The history of all three is given in detail in Vol. I.

The Isle Royale has 3 parallel amygdaloid beds with strike of N. 32° E., and dip of 56° , of which two have been extensively opened, these being the Isle Royale and Portage, the latter lying approximately 200' west of the former. The new shafts are on the Isle Royale lode, but the Portage bed is opened on many levels by crosscuts. East of the amygdaloids is the "Mabbs vein," lying near the Eastern Sandstone, 4' to 7' wide and rich in mass and barrel copper, but deficient in stamp rock. It was opened to a depth of about 250' by John and Austin Mabbs, many years ago, but has not been reopened by the present management. There also are unidentified and unexplored copper-bearing amygdaloids lying west of the Portage, and occasional occurrences of arsenical ores of copper.

No. 1 shaft, near the northern boundary had 3 compartments and was 1,335' deep. The Portage lode, lying 150' to 220' to the westward, was reached by 5 crosscuts, on the 11th to 15th levels, inclusive, and about two miles of drifts were opened thereon. This shaft was completely gutted by fire, late in 1903, and has not been rebuilt. When in operation, stoping in No. 1 was about equally divided between the Isle Royale and Grand Portage beds, these amygdaloids being markedly similar in characteristics and values.

No. 2, located 2,280' southwest of No. 1, is a 3-compartment shaft 1,335' deep. The Isle Royale lode only was stoped from No. 2 before the burning of No. 1, but since then the south drifts of No. 1 on both lodes have been made tributary to No. 2. Concrete dams have been built across the south drifts of No. 1 at the 13th and 14th levels, holding back the mine water and surface water is collected on the 8th level and sent to No. 2 shaft for forking out.

In addition to the two new shafts there are 28 old shafts, in the three old mines, and masonry dams have been built underground at various points to hold back the waters in the old openings. No. 2 shaft has skip tracks laid with 45-lb rails. The Isle Royale bed is 80' in extreme width in certain levels of No. 10 Huron, the southernmost of the old shafts, and the lode is supposed to have been lost in the bottom levels at the southern end of the Huron. The mine has about 8 miles of new openings, in addition to stoped-out openings of about 3 miles in the old Isle Royale and Grand Portage mines and about 5 miles in the Huron. The mine has stopes opened for four years to come, and no sinking has been done since 1902.

In 1904 a new shaft was opened on Section 11., the Isle Royale lode

having been located previously by diamond drill borings. The new shaft is about 7,300' southwest of No. 2 and not far from the center of Section 11. The shaft was started June 3, and drifts started on the 120' level in September. The shaft found but a few feet of overburden and opened phenomenally good ground, rich in mass, barrel and stamp copper. Developments have shown that the principal values at this point favor the footwall. The drifts do not show as rich ground as the shaft, but are in ground of excellent average grade. The lode shows much epidote, where opened by the Section 11 shaft and the developments are decidedly promising. Small shipments were begun late in December, 1904. A new shaft may be sunk to replace the present one, in order to secure a more even balancing of the territory that this shaft will develop. A shaft was started in the summer of 1904 on Section 10, but was discontinued in October, because of the heavy overburden encountered, and a diamond drill substituted. The drill cores show an amygdaloid, about 5' of which carries fine stamp copper.

Shafts Nos. 1 and 2 have duplicate equipments, with combination shaft-rockhouses 44x60' on the ground and 90' high, fitted with 18x24" and 13x20" crushers made by the Portage Lake Foundry & Machine Works. Each shaft has a 3,000-ton coal trestle and a Nordberg two-stage compound 35-drill air compressor. The engine houses are 50x90', of steel on stone foundations. The hoists have 18' 6" drums with lathe-turned grooves for 6,000' of 1½" steel cable, built to hoist 6-ton skips from a depth of 6,000'. Boiler houses are 44x72', with coal storage additions 16x72', each housing three 84" 150-h. p. horizontal Burt boilers. The machine shop is 40x60', of steel on stone foundations, with full equipment of tools required for heavy mining work. A dam to impound feed-water for the boilers is 300x500' in area by 6' deep. There are about 100 good dwellings mostly new, on the company's lands.

The Isle Royale Railroad, owned by the company, connects the mine and mill with 4 miles of main line having easy grades, and is equipped with one 35-ton and one 55-ton locomotive and forty 40-ton steel rock cars with air brakes.

The millsite, at the mouth of the Pilgrim river, has nearly one mile frontage on Portage Lake. The mill is 134x210', of steel frame on stone foundations, with three 2,000-ton rock bins and three 500-ton Nordberg stamps with circular mortars and ¾" screen openings. Each stamp has 32-ton mortars resting on anvil blocks, bedded on platforms 20' square and 3' thick, of 14x24"x20' oak timbers. Underneath each platform is a caisson, reaching to bedrock, made of 5-16" boiler steel, 74' long, and 12' in diameter until near the top, where there is a bell-shaped flare, 20' in diameter, to support the oak platforms under the anvil blocks. The caissons and spaces between are filled with concrete. The dressing floor has 72 rough jigs and 30 finisher jigs of the Parnall-Krause type, slime tables and 1 Bartlett and 2 Wilfley concentrators to treat the slimes from the circular tables. There is a complete machine shop on the second floor of the mill. A 750-h. p. engine runs the mill and shop, taking steam from four 250-h. p. boilers, in a 46x72' boiler-house at the rear of the mill. One head is to be changed

over to a steeple compound early in 1905. During 1904 new crushers with fixed bearings were installed to regrind the coarse gravel escaping from the mortars. The Isle Royale mill now treats the production of the Ahmeek.

Water is furnished the mill by a 16,000,000-gallon Nordberg-Corliss pump, especially designed to handle muddy water and having a triple discharge into a 30" riveted steel water main running 2,200' from pump-house to mill, the pump being located some distance from the mill to obviate stamp-sand clogging the intake. Three 100-h. p. boilers furnish power for the pumps, fuel being taken from a large coal trestle at the rear of the pumphouse boiler rooms, feed water coming from a dam near the mill.

A 32x600' wharf at the millsite, with deep water alongside, has appliances for unloading coal cargoes and general freight, and for the dispatch of mineral from the mills to the smelters at Dollar Bay, just across the lake.

The Isle Royale has proven a disappointment, but ends 1904 with greatly improved prospects due to the encouraging developments on Section 11, and the advanced price of copper. The percentage of refined copper secured, while remaining low, has improved from year to year, the returns being only 11.7 lbs. per ton in 1901, 13.5 lbs. in 1902 and 15.8 lbs. in 1904. Production of fine copper was 3,569,748 lbs. in 1902, 3,134,601 lbs. in 1903 and 2,442,905 lbs. in 1904. The 1903 production was secured from 199,493 tons of rock stamped, at a cost of 11.85 cents, and was sold at 13.12 cents.

ISLE ROYALE LAND CORPORATION, LTD.

MICHIGAN.

Offices: 24, North John St., Liverpool, Eng. Organized June 21, 1890, as Wendigo Copper Co., Ltd., name changed to present title July, 1901. Capitalization £225,000, shares £5 par, in 2,000 first preference, 1,089 second preference and 41,911 ordinary shares. Preference shares all issued and fully paid; 34,504 ordinary shares issued, £4 paid in. Reginald Young, chairman; John Tibbs, secretary; Rufus R. Goodell, agent, Houghton, Mich. Lands, 83,720 acres, mainly copper-bearing, upon the northern fold of the Keweenaw syncline, on Isle Royale, Lake Superior, Michigan, comprising the major portion of the area of this, the largest fresh water island of the globe. Considerable mining of a rather desultory nature has been done upon these lands at various periods in the past, and some copper secured. Last work was done, 1892, under the management of the late Jacob Houghton.

ITSUKI MINE.

JAPAN.

Mine office: Itsuki-mura, Kuma-gori, Higo, Japan. Ore is chalcopyrite associated with iron pyrites, averaging 5% to 6% copper, in veins interbedded in clay-slates. Production in 1900 was 1,080,163 lbs. refined copper.

IVANHOE GROUP.

BRITISH COLUMBIA.

Mine office: Alberni, Vancouver Island, B. C. Has a 140' crosscut tunnel.

IVANPAH CONSOLIDATED SMELTING CO.

CALIFORNIA.

Office. Wilcox Bldg., Los Angeles, Cal. Said to own the Copper World mine, near Manvel and Blake, San Bernardino county, California, with a 40-ton smelter, but letters returned unclaimed from both places.

JACK COPPER MINING & MILLING CO.

A nebulous proposition of doubtful merit regarding which definite information has not been secured.

JACK POT MINING & MILLING CO.**WYOMING.**

Offices: care of H. O. Granberg, secretary and treasurer, Oshkosh, Wis. Mine office: Copperton, Wyo. Capitalization \$1,000,000, shares \$1 par. Lewis Johnson, manager. Lands, 9 claims, opened by 315' of shafts and 70' of laterals, said to show a 70' vein of low-grade ore, improving at depth. Has necessary mine buildings and is developing steadily with a small force.

JACK TAR COPPER CO.**ARIZONA.**

A swindle, promoted by the notorious Wm. F. Wernse & Co., Bond & Stock Co., 421 Olive St., St. Louis, Mo.

JACKSON & BONDURANT.**ARIZONA.**

Office and mine: Quartzite, Yuma, Co., Ariz.

JALISCO COPPER MINING CO.**ARIZONA.**

Office: 135 So. Broadway, Los Angeles, Cal. Mine office: Nogales, Santa Cruz Co., Ariz. Organized under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. A. R. Noon, president; W. J. Stevens, secretary. Lands, 8 claims, area 160 acres, near Oro Blanco, Pima Co., Ariz. Actions of company regarded with suspicion, and apparently no work in progress.

JAMAICA COPPER CO.**JAMAICA.**

Office: Baltimore, Md. Organized January, 1903, with capitalization \$1,000,000. Lands, 1,000 acres, claimed, by company to be heavily timbered with logwood, satinwood, ebony, cedar and walnut. Company claims that shipments of ore to England have returned 22.31% copper. Company regarded dubiously.

JAPAN-FLORA MINES & TUNNEL CO.**COLORADO.**

Office: 310 Colorado Bldg., Denver Colo., Mine office: Telluride, San Miguel Co., Colo. Employs 30 to 40 men. T. Walter Beam, president and general manager; Wm E. Humphreys, secretary. Organized August 22, 1903, under laws of Colorado, with capitalization \$2,000,000, shares \$1 par. Lands, 35 patented claims, area 317 acres, in the Upper San Miguel district, showing 8 fissure veins in andesite breccia carrying auriferous and argentiferous galena and iron pyrites with quartz gangue, averaging about 0.5% copper, 10% lead, 8% zinc, 23.5 oz. silver and \$10 gold per ton, opened by a 685' shaft and 8 crosscut tunnels, two longest 1,600' and 2,752', with 19,655' of underground openings, estimated to give 150,000 tons of ore blocked out for stoping. Has steam and electric power, with 45-h. p. hoist, 2 Leyner air compressors, power drills and shops. Property is being developed along systematic and business-like lines and has produced considerable ore.

JARILLA COPPER CO.**NEW MEXICO.**

Reorganized, 1903, as Three Bears Copper Company.

JARILLA MINING & SMELTING CO.**NEW MEXICO.**

Mine office: Jarilla, Otero Co., N. M. Lands, 20 claims, held under 5-year bond and lease expiring 1909. Said to plan construction of 100-ton smelter.

JASPER MOUNTAIN COPPER CO.**WYOMING.**

Mine office: Douglas, Converse Co., Wyo. H. R. Mewis, superintendent.

JEFFERSON COPPER CO.

A swindle, promoted by the notorious Wm. F. Wernse gang, of St. Louis.

JEFFERSON COPPER MINING CO.

A swindle, perpetrated by the notorious W. C. Calhoun, of Denver.

JEFFERSON COUNTY MINING CO.**MONTANA.**

Mine office: Basin, Jefferson Co., Mont. Organized by eastern parties for the purpose of leasing the mine of the Basin & Bay State Mining Co., which has been done. Apparently mixed up somehow with the La France company.

JEFFERSON-MONTANA COPPER MINES CO.**MONTANA.**

Office: care of Clarence McCornick, Salt Lake City, Utah. Mine office: Corbin, Jefferson Co., Mont. Organized, 1904, to take over about half of the Wickes and O'Connell groups of 39 claims, near Corbin.

JEFFS LAND CO.**MICHIGAN.**

Office: Rockland, Ontonagon Co., Mich. Owns 800 acres of mineral land, north and west of Rockland, on which a little exploring work was done, 1899-1900. Fully described in Vol. I.

JELM TOWNSITE & MINING CO.**WYOMING.**

Office: Kasota Blk., Minneapolis Minn. Mine office: Jelm, Albany Co., Wyo. Idle at last accounts.

T. W. JENEN.**MEXICO.**

Office, mine and works: Magdalena, Sonora, Mex. The smelter, known as Las Maravillas, produced 3,527 lbs. fine copper in 1903.

JEROME CAÑON COPPER CO.**ARIZONA.**

Office: 106½ South Broadway, Los Angeles, Cal. Mine office: Granite, Yavapai Co., Ariz. Organized 1901, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. J. W. Tibot, president; G. B. Tibot, secretary; Jos. S. Smith, superintendent. Lands, 16 claims, including the Copper Glance group, 14 miles northwest of Jerome, showing a vein ranging from 2' to 7' wide, ore from which has given assays up to 28% copper, 60 oz. silver and \$110 gold per ton. Has steam power, air-compressor and drills, hoist and pumps. Officers of company stand well.

JEROME COPPER CO.**ARIZONA.**

Succeeded by Cleopatra Copper Co.

JEROME SILVER-COPPER MINES CORPORATION.**ARIZONA.**

Office: care of C. D. Smith & Co., 25 Broad St., New York. Mine office: Jerome, Yavapai Co., Ariz. Idle at last accounts.

JESSIE BELLE MINING, MILLING & SMELTING CO.**CALIFORNIA.**

Office: 302 Lankershim Bldg., Los Angeles, Cal. Mine office: Daulton, Madera Co., Cal. Organized 1902, under laws of Arizona, with capitalization \$1,500,000, shares \$1 par. W. H. Sallada, president; W. T. Carter, secretary. Lands, 3 patented claims, area 40 acres, with 200' main shaft showing 4 fissure veins carrying oxide, carbonate and sulphide ores assaying 15% to 20% copper, 6 oz. to 10 oz. silver and \$8 to \$15 gold per ton. Has steam

power, air compressor and 30-ton concentrator, and begun production August, 1904, making regular shipments of ore netting \$240 to \$620 per car. Company plans increasing capacity of concentrator to 100 tons daily.

JESUS MARIA MINES CO.**MEXICO.**

Mine office: Parral, Chihuahua, Mex. Percy L. Fearn, manager, at last accounts. Ores carry gold, silver and copper. Has steam power.

MINA JESUS MARIA DE BAQUERACHIC.**MEXICO.**

An old property, once of importance, near the Lluvia de Oro mine, in the state of Chihuahua, Mexico. Ores are copper sulphides, carrying about 5 oz. silver and \$2 gold per ton.

JICARILLA MINING & MILLING CO.**NEW MEXICO.**

Mine office: Jicarilla, Lincoln Co., N. M. Said to plan erection of a custom mill.

JICARILLA MINING & REDUCTION CO.**NEW MEXICO.**

Office: 108 La Salle St., Chicago, Ills. Mine office: Jicarilla, Lincoln Co., N. M. Geo. E. Emery, president; H. G. W. Reinhardt, secretary; Wm. A. Franklin, manager; J. L. Walsh, mill superintendent. Lands are developed by shaft, producing gold-silver-copper ores. Has steam power and 15-stamp mill, and plans building cyanide plant and installing electric power. Employs about 30 men.

J. I. C. MINING CO.**UTAH.**

Office: Salt Lake City, Utah. Mine office: Park City, Summit Co., Utah. G. D. B. Turner, general manager; N. A. McLean, superintendent. Lands, in the vicinity of the Daly-West and Daly Judge, are developed by a 625' shaft. Is controlled, through stock ownership, by the West Quincy Mining Co.

JIMULCO MINING CO.**MEXICO.**

Office: care of City Brewery, San Antonio, Texas. Mine office: Otto, Coahuila, Mex. Employs 350 men. Organized 1901, under laws of Texas, with capitalization \$500,000, shares \$50 par. Otto Wahrmund, president; O. S. Newell, vice-president; S. G. Newton, secretary; John J. Stevens, treasurer; Arthur L. Tuttle, superintendent. Lands, 111 pertenencias, including the Guadalupe, Casita and Alfaris mines, located in a comparatively new mining district, opened by a 300' shaft and 5 tunnels with aggregate length of 5,160'. Ores are oxides and carbonates, shipped to the Aguascalientes plant of the American Smelting and Refining Co. for reduction, and giving average returns of 15% copper, 9 oz. silver and \$2 gold per ton. Has gasoline power, and has built a 5-mile narrow-gauge railway from Otto to Jimulco, connecting at latter point with the Mexican Central railway. Production, 1904, was 1,693,957 lbs. fine copper. Property has a good management and is understood to be earning a small profit over and above the very considerable cost of development.

JOHN D. COPPER MINING CO.**WASHINGTON.**

Property sold to Ethel Consolidated Mines Co.

JOHN DIAS MINE.**CALIFORNIA.**

Property, in Section 12, T. 6 S., R. 16 E., Mariposa Co., Cal., is opened

by a shallow shaft on a 3' vein in schistose diabase carrying cuprite, azurite, chrysocolla and chalcopryrite. Ore is said to assay \$40 per ton in copper and gold.

JOHNNY BULL COPPER MINING CO.

NEW MEXICO.

Office: Stein's Pass, Grant Co., N. M. Company deeply involved, and apparently bankrupt. Idle.

JOHNSON MINE.

NORTH CAROLINA.

Mine office: High Point, Guilford Co., N. C.

JOHNSON MINES.

WASHINGTON.

In the Stanaway district of Kittitas county, Washington. Shipped some native copper and high-grade ore to Puget Sound smelters in 1903.

JOHNSTOWN MINING CO.

MONTANA.

Mine office: Butte, Silver Bow Co., Mont. Is a subsidiary corporation of the United Copper Co., holding title, from the Montana Ore Purchasing Co., to the eastern portion of the Rarus mine, which is involved in the Michael Davitt suit between the Heinze and Amalgamated interests.

JOSEPHINE MINE.

WASHINGTON.

Office: care of Bevis Bros., Spokane, Wash. Property is located in the Metalline camp, Washington. Shafts said to show 11' vein at 50' depth.

JOSEPHINE COPPER MINING & SMELTING CO.

MONTANA.

Organized, 1903, to take over sundry mining claims in the Blackfoot ceded district of Teton county, Montana.

JOSEPHINE GOLD & COPPER MINING CO.

ARIZONA.

Office: care of Herbert S. Shaw, 15 Brown Palace Hotel, Denver, Colo. Mine office: Prescott, Yavapai Co., Ariz. Employs 10 men. Organized under laws of Utah, with capitalization \$1,500,000, shares \$1 par. O. B. Price, Jr., president; E. J. Price, secretary; W. D. Webster, superintendent. Lands, 10 claims, area 200 acres, 8 miles south of Prescott, showing sulphide ores, mainly chalcopryrite, with a little bornite and chalcocite, giving assays of 3% to 75% copper and 5 oz. to 16 oz. silver per ton, with traces of gold. Has steam power and is opened by a 250' shaft, with considerable drifting. Two small smelter shipments gave returns of \$15 and \$30 per ton. Ore will require concentration at the mine to permit profitable production.

JOSEPHINE & CONNECTICUT MINES.

ARIZONA.

Mine office: Patagonia, Santa Cruz Co., Ariz. Owned by R. K. Richardson and Wm. T. Powers. Ores carry copper, silver and gold. Have steam power.

JOSIE GOLD & COPPER MINING CO.

WASHINGTON.

Office: 261 Columbus Ave., Boston, Mass. Mine office: Houghton, King Co., Wash. E. B. Robinson, general manager. Lands, 12 claims, in the Snoqualmine district, 35 miles from Seattle. Has several shallow shafts and short tunnels, all in ore giving fair assay values.

MINA LE JOYA.

SPAIN.

Office: care of Don Manuel Vázquez López, owner, Huelva, Spain. Mine office: El Cerro, Huelva, Spain. Lands, 53 hectares, showing large quantities of cupriferous iron pyrites carrying an average of 48% sulphur. Has a 10-kilometre tram, and is developing and producing.

MINA JUEZ.**MEXICO.**

Office and mine: Ameca, Jalisco, Mexico. José Somerla, owner and manager. Employed about 20 men at last accounts.

JULIA DEANE MINING CO.**UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. David Clay, manager. Has a tunnel showing gold-copper ores. Has steam power.

JUMBO MINE.**BRITISH COLUMBIA.**

Mine office: Rossland, Yale district, B. C. Mine shows a vein ranging up to 30' and more in width, developed both underground and open-cast, with ores ranging from \$7 to \$20 per ton in gross values. Has steam and electric power, air compressor, etc., and plans building a 6,000' aerial tram from mine to the Columbia & Red Mountain railway line. Shipped about 12,000 tons of ore to the Granby smelter in 1904.

JUNCTION DEVELOPMENT CO.**ARIZONA.**

Office: Calumet, Mich. Mine office: Bisbee, Cochise Co., Ariz. Employs 50 men. Organized 1903, under laws of Arizona, with capitalization \$750,000, shares \$15 par; paid in, \$6. Chas. Briggs, president; James Hoatson, vice-president; Gordon R. Campbell, secretary; Peter Ruppe, treasurer; preceding officers, Thomas Hoatson, Geo. E. Tener and C. d'Autremont, Jr., directors; Samuel A. Parnall, superintendent. Is closely affiliated, in management and ownership, with the Calumet & Arizona, Calumet & Pittsburg, Pittsburg & Duluth and Lake Superior & Pittsburg Mining companies, the Junction remaining the only one of these five allied properties that still is in the chrysalis stage, as a development company, the other 4 having been changed from development companies to fully organized mining companies, with greatly increased capitalization.

Lands, 14 claims, area 188 acres, held under bond and lease of \$646,989.75, on which the final payment of \$516,380 will fall due on Jan. 2, 1906. Property lies an eighth to a quarter mile southeast of Sacramento Hill, a 300' gossan blossom which is the keystone to the semi-circular copper measures of the proven portion of the Bisbee basin. The Junction has the Copper Queen and Calumet & Pittsburg to the west, and the Calumet & Pittsburg to the south. The major portion of the Junction tract is covered by the Bisbee conglomerate, flanked on either side by porphyry and limestone. It was the theory of the Junction management that the limestone underlaid the conglomerate, in which contingency the chances of finding large and rich copper ore bodies were excellent. Acting upon this hypothesis, considerable diamond drilling was done, and it is stated that 2 good ore bodies were located by means of these borings, at a depth of about 820'. Permanent development is by a 4-compartment 800' shaft, sunk on the boundary line of the Junction and Calumet & Pittsburg, and to be used jointly by these properties. This shaft, abutting on the Oregon claim of the Calumet & Pittsburg, was not deepened in the latter half of 1904, although the ore bodies cut by the drills are supposed to be only 20' below its bottom, presumably because of the likelihood that at somewhat greater depth this shaft will take part or all of the heavy flow of water, averaging 2,400 gallons per

minute, now handled by the Briggs shaft of the C. & P. The depth of 800' in the Junction shaft is equal to a depth of 940' in the Briggs shaft, allowing for difference in altitude of the collars of the two shafts, and the Briggs shaft, now unwatering the Junction, is 1,150' in depth, equal to 210' deeper than the present bottom of the Junction shaft. A pump station has been cut on the 770' level and it is planned to install therein two 1,000-gallon and two 500-gallon pumps, which should be equal to handling any ordinary flow from that depth. Connection has been secured with the Briggs shaft upon the 770' level, which meets the 910' level of the Calumet & Pittsburg. In driving this drift a considerable body of soft, leached ore was cut. This averaged only 2% copper, too low in tenor to be workable, but holding out encouragement of finding a good body of high-grade ore at a little greater depth.

The Junction shaft has a hoist good for 1,200' depth, 2 boilers and a small air compressor. Foundations are in for a new boiler-house and oil tanks, and a new office building and changing house are being built.

The Junction still lacks the demonstrated values of the Lake Superior & Pittsburg and Pittsburg & Duluth, but in view of the geological conditions pertaining, should find good ore under at least a portion of its tract. How extensive such ore bodies may prove can be told only by development.

JUPITER MINING CO. WYOMING.

Office: Tomah, Wis. Mine office: Holmes, Carbon Co., Wyo. Dr. C. E. Quigg, president; J. A. McKay, vice-president; J. W. Hancock, secretary and treasurer. Lands, sundry claims adjoining the new Rambler on the southwest, with indications that the Jupiter carries the extension of the New Rambler vein.

JURA-TRIAS COPPER CO. NEW MEXICO.

Office: Commercial Club Bldg., Albuquerque, N. M. Mine office; Señorito, Sandoval Co., N. M. Thos. J. Curran, president; Geo. W. Stubbs, secretary and treasurer. Organized October, 1900, under laws of New Mexico, with capitalization \$1,000,000, shares \$1 par. Lands, sundry copper claims and a gold mine. Has a 25-ton smelter. Idle at last accounts.

JUSTICE MINING CO. COLORADO.

Mine office: Central City, Gilpin Co., Colo. Lands, sundry claims carrying ores of gold, silver and copper.

KAFUE COPPER SYNDICATE, LTD. RHODESIA.

Absorbed, 1904, by Rhodesia Copper Co., Ltd.

KAFVELTORPS KOPPARVERK. SWEDEN.

In Orebro Län, Sweden. A small producer, output for 1901 having been 112,590 kgs. of matte, averaging 72% copper, equal to 178,713 lbs. refined copper, and 18,423 kgs. refined copper, giving a net production for 1901 of 214,919 lbs. refined copper, also considerable values in lead and silver, obtained as by-products.

KALAMAZOO COPPER MINING CO. COLORADO.

Office: 232 West Cedar St., Kalamazoo, Mich. Mine office: Encamp-

ment, Carbon Co., Wyo. Organized April 11, 1902, under laws of Wyoming, with capitalization \$1,000,000, shares \$1 par; issued, \$700,000. H. E. Brown, president; E. S. Drury, vice-president; Edwin Gillis, secretary and general manager; W. C. Carson, treasurer. Lands, 10 patented claims, area 95 acres, in the Pearl district of Larimer county, Colorado, carrying 2 fissure veins, opened by 28' and 40' shafts, showing oxide and sulphide ores assaying 2% to 50% copper, with variable values in gold, silver, nickel and zinc. Is under same management as the Coldwater mine, adjoining, and Kalamazoo is idle, permitting the Coldwater to develop to the boundary line.

KAMIOKA MINE.**JAPAN.**

Owned and operated by the Mitsu Bishi Gosshi Kwaisha.

KANGAROO HILLS MINING & SMELTING CO.**AUSTRALIA.**

A consolidation of the Macaulay Creek Silver & Copper Mines and the Mt. Theckla Copper Mine, in the Kangaroo Hills district of Queensland. The Mt. Theckla, opened 1900, produced 23 tons of copper and 6,315 oz. of silver in 1901, from ores averaging 16% copper, 15% lead and 49 oz. silver per ton. Has a smelter, located on the Running river, midway between the mines.

KANSAS-BURROUGHS CONSOLIDATED MINING CO.**COLORADO.**

Office; Equitable Bldg., Denver, Colo. Mine office: Central City, Gilpin Co., Colo. Patrick McCann, superintendent. Ores carry gold, silver and copper. Has steam power.

KANSAS CITY COPPER MINING & SMELTING CO.**COLORADO.**

Office: Kansas City, Mo. Mine office: Oneco, Routt Co., Colo. Oliver W. Kroll, superintendent. Has steam and electric power and 40-ton smelter.

KANSAS CITY GOLD & COPPER MINING & MILLING CO.**COLORADO.**

Incorporated, August, 1902, to develop mines in Saguache Co., Colo.

KANSAS CITY & SONORA MINING & MILLING CO.**MEXICO.**

Property sold, 1903, to Ures Consolidated Mining Co.

KAPUNDA COPPER MINE, LTD.

Was to have taken over the Kapunda mine, but did not go to allotment.

KAPUNDA MINE.**AUSTRALIA.**

Office and mine: care of Varley & James, owners, Kapunda, South Australia. Property, 50 miles north of Adelaide, was opened in 1842, and was worked by tributors, circa 1879-1901. Has 8 shafts, two deepest being about 450' each. Water level is 50' below surface. Vein matter and country rock are very soft. Mine has produced at least \$1,000,000 worth of copper, and carries oxide, carbonate and sulphide ores, with a little native copper, ores averaging about 18.5% copper. Employed about 25 men, at last accounts.

KARANKULSKI MINE.**TURKESTAN.**

A small property near Tashkent, Turkestan, operated in a crude way.

KARGALINSKI WORKS.**RUSSIA.**

Office and works: Orenburg, Russia. E. O. Ternier, manager. Production in 1899 was 680,674 lbs. refined copper.

COMPAGNIE DU KATANGA.**CONGO FREE STATE.**

Office: 48, Rue de Namur, Brussels, Belgium. Edouard Despret, chairman; Col. A. Thys, managing director; Major A. Cambier, manager; A. J. Wauters, secretary. Organized April 15, 1901, under laws of Belgium, as a subsidiary corporation of the Belgium Congo Company, with capitalization 3,000,000 francs. Lands, 50,000,000 acres freehold, with sundry preferential mining and railway rights. Mining property is four groups, known as the Katanga, Kambove, Pala and Kazemba, located on the left bank of the upper Lualaba river, showing auriferous copper ores. Development is in charge of Grey & Holland, African managers of the Tanganyika Concessions, Ltd., and has not as yet advanced beyond the exploratory stage, but the showing is said to be quite promising.

KATARSKI MINE.**RUSSIA.**

Office: care of H. Lorenz, Elizabethpol, Russia. Is one of the principal copper producers of Russia. Output for 1899 was approximately 4,765,000 lbs. refined copper.

KAWADAYAMA MINE.**JAPAN.**

Mine office: Sanyama-mura, Oe-gori, Awa, Japan. Ore is chalcopyrite, mixed with iron pyrites, averaging 4% copper, in a 2' to 4' vein in amphibolite. Production in 1900 was 14,834 lbs. refined copper.

KEARNS CONSOLIDATED COPPER MINES CO.**WYOMING.**

Office: 519 Equitable Bldg., Denver, Colo. Mine office: Downington, Carbon Co., Wyo. Organized 1899, under laws of Wyoming, with capitalization \$1,500,000, shares \$1' par. Foster Kearns, president; A. Hanson, secretary; Geo. C. Waterman, superintendent. Lands, 11 claims, area 216 acres, also the 160-acre townsite of Downington, in the Upper Platte section of the Grand Encampment district, showing 4 fissure veins, of which 2 are being developed, principal vein having estimated width of 40' and length of 1 mile, apparently the largest ore body in Wyoming. The 3 smaller veins range from 10' to 20' wide. Estimated average values, 2% to 10% copper and \$1 to \$8 gold per ton, from oxide and carbonate ores above and sulphides at a little depth, opened by 5 shafts, of 10' to 40', and a 60' tunnel. Has steam power and sundry mine buildings. Property regarded as valuable and management honest.

KEARSARGE MINE.**MICHIGAN.**

Absorbed, 1897, by Osceola Consolidated Mining Co.

KEDABENSKI MINE.**RUSSIA.**

Office: care of Gebrüder Siemens, owners, Berlin, Germany. Mine office: Kedabeg, Elizabethpol, Russia. Is sometimes called the Kiadebek. Was reopened in 1864, by present owners, and has been a considerable producer since. Ore is mainly chalcopyrite, associated with iron pyrites, pyrrhotite and sphalerite, with occasional occurrences of chalcocite and native copper, gangue being quartz and heavy spar. Ore bodies are irregular masses in quartz trachyte veins traversing diorite. Ores average 3% to 5% copper, and are sorted on surface into smelting-grade ore averaging 7% and leaching ore averaging 3% copper. Smelter has reverberatory furnaces and burns

crude petroleum, which is pumped 30 miles from Daliar, on the Trans-Caucasian railway, through a pipe-line. Product of first fusion is a 25% to 30% matte, which is broken up and roasted, then blown up to blister copper in blast furnaces. The blister copper is of low grade, carrying about 88% to 90% copper, 25 oz. silver and 1.2 oz. gold per ton, and is refined electrolytically at Kalakent. Production was about 4,500,000 lbs. fine copper in 1900, about 3,400,000 lbs. in 1902, and 2,966,720 lbs. in 1904, decline in output being due to gradual exhaustion of the old ore bodies, which are not being replaced by new discoveries.

KEMP-KOMAR MINING CO.

WASHINGTON.

Mine office: Loon Lake, Stevens Co., Wash. A. W. Kemp, manager. Ores, oxide and carbonate above and sulphide in lower workings, carrying small gold and silver values, in a 12' vein with pay-streak of 6" to 5'. Car-load shipments have returned 16% to 20% copper.

KEMPTON MINE.

UTAH.

Office: care of Col. A. E. Wall, owner, Salt Lake City, Utah. Is in the Bingham district of Salt Lake county, Utah, carrying lead and copper ores, values mainly in the former.

KENDRICK & GELDER SMELTING CO.

COLORADO.

Absorbed by San Juan Smelting & Refining Co.

KENNETT MINING CO.

MONTANA.

Mine office: Virginia City, Madison Co., Mont. W. B. Millard, general manager. Ores carry gold and copper. Has steam power and a 60-ton stamp mill, employing about 40 men at last accounts.

KENTUCKY GULCH MINING CO.

COLORADO.

Mine office: Tin Cup, Gunnison Co., Colo. P. D. McNeil, superintendent. Ores carry gold, silver and copper. Has steam power.

KEREMOS COPPER MINES, LTD.

BRITISH COLUMBIA.

Mine office: Olalla, East Yale district, B. C. Dr. A. C. Sinclair, president; E. N. Ouimette, secretary and treasurer; R. W. Northey, superintendent. Organized December, 1900, with capitalization \$1,000,000, shares \$1 par. Has a few shallow shafts and short tunnels showing a 6' vein with 18" pay-streak of mispickel carrying 5% to 15% copper. Works a few men summers only.

KESWICK SMELTING WORKS.

CALIFORNIA.

Owned and operated by the Mountain Copper Co., Ltd.

KETCHIKAN COPPER CO.

ALASKA.

Office: care of W. D. Lamb, secretary and treasurer, Seattle, Wash. Mine office: care of Victor Vigelius, president, Ketchikan, Alaska. Capitalization \$2,500,000, shares \$1 par. Lands, 5 claims, area 100 acres, held on 2-year bond and lease, about 3 miles east of Coppermount, Prince of Wales Island, Alaska, also 2 gold-silver claims on Kulu Island, about 2 miles from Kell Bay. Copper claims regarded as promising.

KEWEENAW ASSOCIATION.

MICHIGAN.

Office: 87 Milk St., Boston, Mass. J. M. Longyear, agent, Marquette,

Mich. A land corporation, owning large tracts in the upper peninsula of Michigan, a portion of the lands being on the Keweenaw copper belt.

KEWEENAW COPPER CO.

MICHIGAN.

Office: care of Chas. A. Wright, president, Hancock, Mich. James H. Bailey, secretary and treasurer. Organized March 13, 1905, under laws of Michigan, with capitalization \$10,000,000, in 400,000 shares, of \$25 par value, being the first mining corporation to take advantage of the amendment to the Michigan mining laws that permits a capitalization quadruple the former maximum of \$2,500,000. Of the capital stock, only 150,000 shares will be issued for the present, 250,000 shares being retained in the treasury for the acquisition of other properties, and for development purposes.

Lands are very extensive, including about 8,600 acres, all in Keweenaw county, Michigan, of which about 8,000 acres are on the mineral belt, this being the largest amount of mineral land held by any Lake Superior copper mining company. Lands include the tracts formerly owned by the Mandan, Medora, Empire, Aetna, Girard, Philadelphia & Boston, Keweenaw and Vulcan mining companies.

The Keweenaw Copper Co. also owns the outstanding stock of the Lac La Belle & Calumet Railroad Company, which has about 8 miles of track in Keweenaw county, with a terminus on Lac La Belle, a land-locked harbor on the southern shore of the Keweenaw peninsula. The title of this line is to be changed to the Keweenaw Central, and a survey is nearly completed for the building of a 35-mile standard-gauge line, to have terminals at Calumet and Lac La Belle. It is planned to begin construction of this line in the spring or summer of 1905, and the road will be controlled by the Keweenaw Copper Co.

Mr. Wright, president of this company, was the original promoter of the Copper Range railroad, and the Keweenaw Copper Co. is planned to stand in somewhat similar relation to the mineral interests of Keweenaw county as the Copper Range Consolidated Co. stands toward the South Range, which includes portions of Houghton and Ontonagon counties. The development of the copper measures of Keweenaw county has been hampered greatly by the lack of rail facilities, which are absolutely necessary to successful mining in any low-grade district, the Lake Superior field being the lowest in average grade of any important or producing copper district of the world. As a consequence of inadequate transportation facilities, there are no active mines, except the Phoenix, in Keweenaw county, outside of the extreme southern portion, where some rich mines, such as the Mohawk, Allouez and Ahmeek, are being developed, with the aid of extensions of several of the Houghton county railroad lines. The Keweenaw Copper Co., through its railroad, the Keweenaw Central, should prove the most important factor in reviving the once important, but long decayed mining interests of Keweenaw county.

KEY CITY COPPER CO.

BRITISH COLUMBIA.

Office: care of Capt. Andrew Wasson, president and general manager,

Sacramento, Cal. Mine office: Mt. Sicker, B. C. F. W. McCrady, superintendent. Property adjoins the Tyee and Lenora, and is opened by tunnel. Has steam power.

KEYSTONE COPPER MINING CO.**NEW MEXICO.**

Office: Bloomsburg, Pa. Mine office: Tres Piedras, Tacos Co., N. M. J. P. Rinker, superintendent. Lands, 18 claims, known as the Payroll mine, in the Bromide district, opened to depth of about 250' and showing a 20' vein of sulphide ore assaying 6% to 12% copper, with fair gold values. Has steam power and 50-ton concentrator.

KEYSTONE COPPER & GOLD MINING CO.**ARIZONA.**

Office: 502 Park Bldg., Pittsburg, Pa. Mine office: Wickenburg, Maricopa Co., Ariz. Organized 1900, under laws of Arizona, with capitalization \$1,250,000, shares \$10 par. C. B. McLean, president; W. J. Strassburger, secretary and general manager; W. F. Wilson, treasurer. Lands, 24 claims, in the Blue Tank and Black Rock districts, showing sulphide ore bodies. Idle.

KEYSTONE COPPER SMELTER CO.**MEXICO.**

Office: 330 Drexel Bldg., Philadelphia, Pa. General Mexican office: Apartado 222, Guadalajara, Mex. Mine office: Tapalpa, Jalisco, Mex. Organized under laws of New Jersey, with capitalization \$300,000, shares \$1 par. Robt. P. Molten, president; Edw. E. Cattell, vice-president and chairman of executive committee; Aubrey F. Lee, secretary; Danl. Lamont, Jr., treasurer; Albert L. Waters, general manager; Wm. B. Duesler, general superintendent. Lands, 5 groups, including La Americana, La Palma and 7 other mines, carrying gold, silver and copper, developed by a 365' tunnel. Has steam and electric power, a 40-ton concentrator and a 30-ton wood-burning matting smelter, product being turned out as matte of 30% to 48% copper tenor. Employs about 100 men.

KEYSTONE GROUP.**ARIZONA.**

Mine office: Globe, Gila Co., Arizona. Finletter & Harvey, owners; J. R. Finletter, superintendent. Property is about 8 miles west of Globe, carrying chrysocolla, with occasional carbonates and a little chalcopyrite, in an 18" fissure vein traversing granite. Property was shipping about 150 tons of high-grade ore monthly to the Old Dominion smelter at close of 1904.

KEY TO SUCCESS COPPER MINING, SMELTING**UTAH****& DEVELOPMENT CO.**

Office: care of A. R. Merritt, Duluth, Minn. Organized 1902, under laws of South Dakota, with capitalization \$1,500,000. Lands are in the Beaver Lake district of Beaver county, Utah. Presumably idle.

KEY WEST MINING CO.**NEVADA.**

Mine office: Bunkerville, Lincoln Co., Nev. S. W. Darling, superintendent. Ores carry nickel, copper and platinum. Has steam power.

KHAYYAM COPPER CO.

Letters returned unclaimed from former office, 1920-150 Nassau St., New York.

KIADBEK MINE.**RUSSIA.**

Described under title Kedabenski mine.

KILLINGDAL KOBBERVAERK.**NORWAY.**

Operated by Bede Metal & Chemical Co.

KIMBALL CREEK MINING CO.**WASHINGTON.**

Office: Seattle, Wash. Mine office: Berlin, King Co., Wash. J. T. Wright, superintendent. Ores carry gold, silver and copper. Has water power.

KIN-E-CHY MINING & MILLING CO.**ARIZONA.**

Office: 1112 Majestic Bldg., Detroit, Mich. Mine office: Wilcox, Graham Co., Ariz. Organized 1902, with capitalization \$1,000,000, shares \$1 par. Herman Knorr, president; Fred. P. Obenauer, secretary and treasurer. Lands, 20 claims, area 480 acres, in 2 groups, in the Aravaipa district. The copper group, 14 claims, has a 6x7' shaft, 80' deep, sunk in silver-lead ore said to average \$20 to \$27 per ton. The gold group, 6 claims, shows a considerable body of low-grade gold ore and has a small mill, completed October, 1903. Company said to have expended about \$20,000 in development, during past 2 years.

KING COPPER MINING CO. OF NEVADA.**NEVADA.**

Office: 431 Exchange Bldg., Boston, Mass. Mine office: Lovelock, Humboldt Co., Nev. T. H. Lowe, superintendent. Property is the Anderson mine, carrying auriferous and argentiferous copper ores, slightly developed.

KING GOLD & COPPER MINING CO.**WASHINGTON.**

Office: Davenport, Wash. Mine office: Springdale, Stevens Co., Wash. Jas. B. Tuttle, Sr., superintendent; J. B. Tuttle, Jr., secretary and treasurer. Property is the Edna-Gladiator mine, 9 miles west of Springdale, opened by a 370' shaft in a contact vein, between diorite and quartz, carrying tenorite and chalcocite of \$10 to \$35 value per ton, with a silicious gangue. Has steam power, a 60,000-gallon pump, hoist, 8-drill air compressor and electric light plant, with necessary shops, bunkhouses, ore bins, etc. Property seems well managed and promising.

KING GOLD & COPPER MINING & MILLING CO.**CALIFORNIA.**

Office: 921-185 Dearborn St., Chicago, Ill. Mine office: Victor, San Bernardino Co., Cal. Company advertises to give an absolutely guaranteed investment, consequently must be managed either by fools or rascals.

KING MINING CO.**WYOMING.**

Office: Fremont, Neb. Letter returned unclaimed from former mine office, Riverside, Carbon Co., Wyo. T. Carroll, president and general manager; J. O. Bell, secretary; J. H. Knowles, treasurer.

KING EDWARD MINING CO.**ONTARIO.**

Office: care of Samuel Jeffery, secretary, Calumet, Mich. Organized 1904, under laws of Ontario, with capitalization \$3,000,000, shares \$10 par. Henry Fliege, president, Paul P. Roehm, vice-president; W. J. Galbraith, treasurer; Capt. Wm. F. Ashton, superintendent. Property is same distance east of Sault Ste. Marie, in Algoma, Ontario, developed by a shallow shaft

said to show a 25' vein of chalcopyrite, from which assays of 9% copper have been secured.

KING SOLOMON MINE.**BRITISH COLUMBIA.**

Office: care of D. C. Corbin, owner, Spokane, Wash. Mine office: Greenwood, B. C. Shipped about 700 tons of ore in 1902.

KING SOLOMON TUNNEL MINING CO.**COLORADO.**

Mine office: Frisco, Summit Co., Colo. James H. Myers, superintendent. Ores carry gold, silver, lead and copper.

KINGMAN CLAIM.**CALIFORNIA.**

Mine office: Darwin, Inyo Co., Cal. Jas. McDonald, owner. Ores are malachite, cuprite and calcopyrite, carrying a little gold and silver, in a 3' contact vein between limestone and granite.

KISHORN MINE.**SCOTLAND.**

Office and mine: care of Mrs. M. M. H. Stewart, Kishorn, Loch Carron, Rosshire, Scotland. Property was worked toward close of Eighteenth or opening of Nineteenth Century, but has remained idle since, until reopened in 1904. Employs about 80 men, in development work.

KITANNING COPPER MINING CO.**WASHINGTON.**

Office: 114 Cherry St., Seattle, Wash. Letter returned unclaimed from former mine office, Index, Snohomish Co., Wash. W. C. Rutter, superintendent, at last accounts.

KITTICOOLO GOLD-COPPER MINE, LTD.**SOUTH AUSTRALIA.**

Office: care of T. S. Backhouse, Glenelg, South Australia. Mine office: Reedy Creek, South Australia. Is a small producer, the property, sometimes known as the Tungkillio mine, opened 1845 and 34 miles northeast of Adelaide, being held under lease from the Australian Mining Co., since 1879. Ores are rich but lumpy and in early days averaged 22% copper. Has two main veins, one apparently worked out, and on Baker's lode has shafts of 240' and 360'.

KITTILSLAND KOBBERVAERK.**NORWAY.**

Letter returned unclaimed by former owners, N. Kior & Co., Christiania, Norway. Property idle at last accounts.

BERGVERWALTUNG KITZBÜHEL.**AUSTRIA.**

A small producer in the Austrian Tyrol.

KJOLI MINES, LTD.**NORWAY.**

Offices: Basildon House, Moorgate St., London, E. C., Eng. Mine office: Reitan, Aalen, Guldalen, Norway. Organized July 29, 1903, with capitalization £100,000, shares £1 par; issued, £70,000. Debentures, £40,000, at 6%. R. C. Richards, chairman; C. S. Goodwyn, secretary. Property is the Kjoli group of mines, idle at last accounts.

BERGVERWALTUNG KLAUSEN.**AUSTRIA.**

Mine office. Klausen Pfunderberg, Tyrol, Austria.

FAHLERZBERGBAU GROSS- UND KLEINKOGEL.**AUSTRIA.**

A very old mine in the Austrian Tyrol. Said to be nearly exhausted, but continues a small producer.

GEWERKSCHAFT KLINGENTHAL-GRASLITZER**GERMANY.****KUPFERBERGBAU.**

Mine office: Klingenthal, Saxony, Germany. Erhart August Schledt, manager. Has a 100-metre main shaft, developing chalcoppyrite ores, and employs about 100 men.

KLIPKOP (NAMAQUALAND) COPPER SYNDICATE, LTD.**CAPE COLONY.**

Voluntarily wound up.

KNAPP MINING CO.**COLORADO.**

Mine office: Pearl, Larimer Co., Colo. Property is controlled by the National Mining & Milling Co.

KNICKERBOCKER DEVELOPMENT CO.**MONTANA.**

Mine office: Helena, Lewis & Clarke Co., Montana. Lands, 8 claims, across the Missouri river and a short distance north of Helena. Developments show ore assaying up to 30% copper and some small shipments have been made.

KNOCKMAHON MINES.**IRELAND.**

Old properties, long idle, near Waterford, Ireland. Ore occurs in clay slates and averaged 10% copper when worked. Annual production was about 1,000 tons refined copper, circa 1840, but mines long idle. Property said to be worthy of investigation.

KOEI MINE.**JAPAN.**

Mine office: Tsunekanematsu-mura, Ashina-gori, Bingo, Japan. An old property, reopened 1893. Ore is chalcoppyrite, associated with sphalerite, iron pyrites and micaceous hematite, in a fissure vein 4' to 8' wide, with gangue of talc and hornblende. Country rock is hornblende-granite. Concentrated ore averages 13.4% copper and 4% silver. Production in 1900 was 88,495 lbs. fine copper.

KOKOMO-PIONEER MINING & MILLING CO.**COLORADO.**

Mine office: Dumont, Clear Creek Co., Colo. E. H. Wilson, superintendent. Property includes the Kokomo, Pioneer and Milton mines, producing ores carrying gold, silver, lead and copper. Has steam, water and gasoline power and 30-stamp mill, employing about 25 men at last accounts.

KOKUSEI MINE.**JAPAN.**

Mine office: Kawabe-mura, Shonan-gori, Mimasaka, Japan. Ore is chalcoppyrite, mixed with iron pyrites and small quantities of sphalerite, ore occurring as lenses, the largest 60' in diameter, with clay gouge, in sandstone and clay-slate. Was opened 1882 and production, 1899, was 348,497 lbs. fine copper.

KOMAKI MINE.**JAPAN.**

Located in the provinces of Ugo and Rikuchu, Japan. A very old mine, giving considerable gold as a by-product. Annual production, according to latest returns secured, averages about 1,000,000 lbs. refined copper.

KOOTENAI COPPER MINING & SMELTING CO.**IDAHO.**

Office: care of C. D. Porter, president, Spokane, Wash. Mine office: Port Hill, Kootenai Co., Idaho.

KOOTENAI COPPER-GOLD MINING CO.

Office: 15 Exchange pl., Jersey City, N. J. Incorporated November, 1902, under laws of New Jersey, with capitalization \$500,000 by Horace B. Gould, John R. Turner and Louis B. Dailey. Location of lands, if any, not learned.

KOSAKA MINE.**JAPAN.**

Mine office: Kosaka-mura, Kazuno-gori, Rikuchu, Japan. Owned by the Fujiti Gumi. F. Kuhara and K. Taketa, managers. Mine has steam, water and electric power and a good smelter, employing about 2,500 men. Ores are of a considerable variety, including azurite, malachite, chalcopryite, native copper and native silver. Ore body occurs as an impregnation, ranging from 20' to 300' in workable width, with proven length of 2,500' and opened to depth of 300'. Country rocks are Tertiary tuff, with intrusions of liparite and dacite, ore body being near the contact of dacite with tuff. Property is one of the most profitable in Japan. Production for 1900 was 856 momme gold, 1,059,653 momme silver and 2,168,756 lbs. fine copper.

KOSK CREEK GROUP.**CALIFORNIA.**

Claims near Olena, Shasta Co., Cal. Native copper is found in joints of the upper portion of a 200' strata of basalt, with sulphide ores below.

KREMLIN MINING CO.**UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. D. M. Houston, superintendent. Ores carry copper and gold. Has steam power.

KRUGER COPPER & SILVER MINING CO.**MEXICO.**

Office: 50 Congress St., Boston, Mass. Mine office: Cusihiuiriáchic, Chihuahua, Mex. Organized August, 1903, under laws of South Dakota, with capitalization \$500,000, shares \$5 par. Edward Glines, president; Philip A. Warner, vice-president and consulting engineer; James P. Hughes, secretary; Edgar M. Parker, treasurer; Geo. W. Boyce, general manager. Lands, 42 pertenencias, area 104 acres, having an old 80' shaft, said to show copper carbonates and chalcocite, with associated gold and silver values. Company reports that it employs 40 men.

KUPFERKIESBERGBAU KELCHALPE.**AUSTRIA.**

Mine office: Kelchalpe, Tyrol, Austria. A very small producer.

GEWERKSCHAFT KUHLENBERGER ZUG.**GERMANY.**

Office: Düsseldorf, Germany. Property is sundry mines in the province of Westfalen, carrying ores of silver, lead, copper, zinc and iron. Company employs about 100 men.

KUNE MINE.**JAPAN.**

Owned and operated by Furukawa Copper Co.

GEWERKSCHAFT KUPFERBERG.**GERMANY.**

Mine office: Kupferberg, Bavaria, Germany. Ferdinand Kröner, agent.

KUPFERKIESBERGBAU KUPFERPLATTE.**AUSTRIA.**

Mine office: Kitzbühel, Tyrol, Austria. Ore is chalcopryite with quartz gangue, occurring as horizontal beds in Silurian slates. Is one of the principal copper producers of the Austro-Hungarian empire.

KURILLA MINE.**AUSTRALIA.**

Owned and operated by the Wallaroo & Moonta Mining & Smelting Co., Ltd.

KUROTAKI MINE.**JAPAN.**

Mine office: Motokawa-mura, Tosa-gori, Tosa, Japan. Is a short distance only from the famous Besshi mine. Ore is chalcopryite, first-quality averaging 10% and second-grade 2% to 4% copper. Beds are much contorted, principal widths and values being found in the saddles and troughs, which average about 10' thick. Output for 1900 was 151,890 lbs. refined copper.

KURTZ-CHATTERTON COPPER MINING CO.**WYOMING.**

Property controlled by National Mining & Milling Co.

KUSAKURA MINES.**JAPAN.**

Owned and operated by the Furukawa Copper Co

KVANANGENS KOBBERGRUBER.**NORWAY.**

Described under title Altens Kobbergruber.

LA CANANEAS COPPER CO.**MEXICO.**

Office: care of Elud N. Darling, secretary, 10 Wall St., New York. Mine office: La Cananea, Sonora, Mex. Fred A. Trittle, president. Was promoted by Henry B. Clifford & Co. Present management said to be in the hands of P Sandoval & Co., substantial bankers of Nogales, Ariz., and Nogales, Sonora, Mex. Organized under laws of Arizona, with capitalization \$5,000,000, shares \$5 par. Lands, 230 acres, including La Libertad and El Ultimatum groups, near the Greene Consolidated. Property thought to be promising, but it cannot be learned that any work is in progress.

LA CLEDE GOLD & COPPER MINING CO.**COLORADO.**

Office: Kittredge Bldg., Denver, Colo. Mine office: Ohio, Clear Creek Co., Colo. Organized November, 1903, with capitalization \$1,000,000, shares \$1 par. J. H. Holloway, president; I. E. Black, secretary. Lands, 4 claims, area 80 acres, also a \$20,000 3-year bond and lease on the Ohio mine, opened by a 300' shaft and 1,200' tunnel and having steam power. The Ohio has produced about \$250,000 worth of ore, but was flooded by cutting an underground watercourse, and remained idle until taken over by present company.

LA DICHA MINING & SMELTING CO. OF MEXICO.**MEXICO.**

Stock controlled by Mitchell Mining Co.

LA DURA MILL & MINING CO.**MEXICO.**

Mine office: Dura, Sonora, Mexico. Property is on the Yaqui river, in the Sahuaripa district of Sonora. Employs a considerable force and is a small but regular producer, having made 150 metric tons of copper matte in 1902, and 72 metric tons in 1903.

LA DURA MINING CO.**MEXICO.**

Mine office: care of Hartmann & Groff, managers, Torres, Sonora, Mex. Ores carry gold, silver, copper and lead. Has steam power and employs a considerable force, shipping product as silver-lead-copper concentrates.

SOCIETE ANONYME LA ESTRELLA.**SPAIN.**

Office: 161, Boulevard Haussmann, Paris, France. Mine office: Los Martires, Granada, Spain. Capitalization, 200,000 francs. Don Huberto Meersmans, general manager; Don Antonio Melián, superintendent. Property includes La Jerezana and other mines of copper, at Los Martires, termino del Boza, Granada, also an argentiferous copper group at Alpujarra, Granada. La Jerezana and adjoining mines now are in process of development.

NUEVA SOCIEDAD PROPIETARIA LA ESTRELLA.**SPAIN.**

Office: Granada, Spain. Property includes El Ensueño and La Jerezana mines, under option or lease to the Société Anonyme La Estrella, of Paris.

LA FLORENCIA GOLD & COPPER CO.**MEXICO.**

Office: 30 South Ninth St., Richmond, Va. Mine office: Cos, Sonora, Mex. D. A. Ainslie, president; R. F. Hudson, secretary; Tom L. West, general manager. Organized 1902, under laws of West Virginia, with capitalization \$1,000,000, shares \$1 par. Lands, 134 pertenencias, area about 330 acres, 25 miles from nearest railroad, showing a wide mineralized belt with heavy iron capping traceable 2 miles. Main shaft, 250', with 50' crosscut in ore assaying 5% to 9% copper, with fair gold and silver values. Property considered valuable.

LA FLORIDA MINING, MILLING & DEVELOPING CO.**MEXICO.**

Company moribund.

LA FRANCE COPPER CO.**MONTANA.**

Company by this title said to have been formed by a merger of the Basin & Bay State Mining Co. and Basin Reduction Co., but no trace of company secured, and letter returned unclaimed from Basin, Jefferson Co., Mont.

MINA LA LAPILLA.**SPAIN.**

Mine office: Alosno, Huelva, Spain. Wm. Guthrie Bowie, manager. A group of government concessions adjoining the Tharsis mine. Ores range from 2.5% to 8% copper, and 47% to 50% sulphur, occurring as a very wide lense. Was formerly operated by pillar-and-stall, leaving large quantities of ore in floors and pillars. Has about 1,200,000 tons of ore available underground, and much more if worked open-cast. Output is lessened because of poor ventilation. Property shows enormous quantities of scoria, left from smelting operations of the Romans. Is well equipped with machinery.

LA MANGIARDE, LTD.**FRANCE.**

Offices: 5, Clements Inn, Strand, London, W. C., Eng. Mine office: La Tour-sur-Tinée, Alpes Maritime, France. Organized October 30, 1903, with capitalization £4,000. T. Cowperthwaite chairman. Lands, sundry coal mines and undeveloped mineral lands carrying indications of copper, in the neighborhood of Nice.

LA NATIVIDAD MINING CO.**MEXICO.**

Office: 17-21 Park Row, New York. Letter returned unclaimed from former mine office, Coapa, Michoacan, Mexico. Robert E. Crutchfield, president; Manuel L. Ward, secretary. Capitalization \$1,500,000, shares \$10 par. Lands, 100 pertenencias, area 247 acres, adjoining the Donna Luisa

and Santa Emilia mines, in the municipality of Acaton, district of Morelia, Michoacan, slightly developed by a 100' shaft, showing rich ores. Company makes grossly exaggerated statements in its advertising, and is regarded with suspicion.

COMPANIA MINERA LA PAZ.

MEXICO.

Mine office: Cuatro Cienegas, Coahuila, Mex. Has argentiferous copper ores and employed about 75 men at last accounts.

LA PLATA CONSOLIDATED MINING CO.

UTAH.

Office: 310 Converse Bldg., Boston, Mass. Mine office: Ogden, Weber Co., Utah. Howard Carpenter, president; A. W. Mansur, secretary; U. V. Withee, manager. Ore values developed are chiefly in silver and lead, with a little copper, and indications of increase in copper values at depth.

LA SAL COPPER MINING CO.

COLORADO.

Succeeded, 1904, by Consolidated La Sal Mining & Smelting Co.

LA SOLEDAD MINING CO.

MEXICO.

Mine office: Ameca, Jalisco, Mex. C. D. O'Brien, manager. Has copper ores, developed by tunnel, and employed about 20 men at last accounts.

LA UNION COPPER MINING CO.

ARGENTINA.

Mine office: Humahuaca, Jujui, Argentina. Has steam power and a small smelter, employing about 100 men.

LABOR CO-OPERATIVE GOLD, SILVER & COPPER MINING CO.

BRITISH COLUMBIA.

Office: 99 Washington St., Chicago, Ill. Mine office: Golden, B. C. Organized under laws of British Columbia, with capitalization \$150,000, shares 10 cents par. Philip Chesley, president; Rev. C. E. Nylin, secretary and treasurer. A dirty swindle, operated under garb of religion, by Parson Nylin, a Baptist preacher, who is a disgrace to the cloth, with the aid of Chesley and other accomplices. Whole outfit should be jailed.

LADD METALS CO.

IDAHO.

Office: First & Stark Sts., Portland, Ore. Mine office: Mineral, Washington Co., Idaho. Works office: Landore, Idaho. Employs 75 men. Chas. E. Ladd, president; Samuel Peacock, vice-president and general manager; John Snow, secretary and treasurer; Geo. D. Rich, general superintendent; John Williams, mine superintendent. Lands, 4 claims, at Mineral, near Weiser, bought of the Consolidated Copper Co., opened by shafts and tunnels, producing argentiferous copper ores. Smelter, at Landore, has a daily capacity of 60 tons. A former superintendent devised a new smelting system, with a double stack, combining a reverberatory and a blast furnace, with a downward blast and a moist updraft, charging being in both furnaces and partly between. Fuel was to have been furnished by a gas producer consuming wet, rotten, white fir wood. The theory and practice did not correlate consecutively, so to speak, and a new smelter superintendent is building a new blast furnace along the ordinary lines, and this will be blown in with ordinary coke for fuel, early in 1905.

LADY CHELAN COPPER CO.

WASHINGTON.

Office: 234 Hyde Bldg., Spokane, Wash.

LADY ELGIN COPPER MINING CO.**MAINE.**

Moribund. Had a mine at Blue Hill, Hancock county, Me., circa 1880.

LADY HELEN COPPER MINING CO.**ARIZONA.**

Mine office: Pima, Graham Co., Ariz. Organized under New Jersey laws, with capitalization \$1,000,000, shares \$1 par. A. J. Halter, president. Lands, 100 acres, in the Clark district of Graham county. Idle.

LADY POND MINE.**NEWFOUNDLAND.**

An idle property at Lady Pond, Newfoundland. Last worked by Newfoundland Copper Co., circa 1900. Now owned by Carmen Copper Mines, Ltd.

LAKE GEORGE MINES, LTD.**AUSTRALIA.**

Reorganized, 1904, as Lake George Successors, Ltd.

LAKE GEORGE SUCCESSORS, LTD.**AUSTRALIA.**

Offices: 10, Walbrook, London, E. C., Eng. Mine office: Bungendore, N. S. W., Australia. A. J. Marks, chairman; N. R. G. Rivington, mine manager; H. R. Westall, secretary. Organized June 8, 1904, as a second reconstruction of the Lake George Mines, Ltd., with capitalization £10,000, shares 1s. par. Lands, 172 acres freehold, at Captains Flat, Lake George, N. S. W. Ores carry copper, silver and gold. Has cyanide plant and small smelter, with reserves of about 11,000 tons of ore, said to be unpayable. Mine was opened 1882, and has a depth of about 600'. Main vein is 22' to 30' wide, and very persistent, having a meridional strike and vertical dip, in a country-rock of Silurian slates. Ore occurs as replacements along fault-lines, and is a compact, fine-grained mixture of chalcopyrite, sphalerite, galena and iron pyrites, in an aluminous quartzose gangue. Ore averages about 1.5% copper, with small gold and silver values, and is very refractory. Has four 60-ton water-jacket blast furnaces, using 50% flux and 50% fuel charges, and also has employed pyritic smelting. Annual production formerly was about 500 tons of fine copper, sold as matte carrying 30% to 35% copper, and carrying about 200 oz. silver and 5 oz. gold per ton of blister copper. Present operations are confined to development on a small scale, during which small patches of native copper have been found.

LAKE HURON COPPER SYNDICATE, LTD.

Voluntarily wound up, February, 1901.

LAKE SHORE MINING CO.**MICHIGAN.**

Office: care of W. H. Garlick, president, Ontonagon, Mich. Mine office: Green, Ontonagon Co., Mich. Organized under laws of Michigan. Lands, 773 acres, in 51-44, Ontonagon county, showing 3 copper-bearing veins, principal one being 12' in width, showing oxide ore and chalcocite giving assays of 1.8% to 6.1% copper. A little exploring work was done, late in 1904, and explorations will be resumed in spring of 1905.

LAKESIDE GOLD-COPPER MINING CO.**WASHINGTON.**

Letter returned unclaimed from former office, Spokane, Wash. Mine office: Sheridan, Mont. Capitalization \$1,000,000, shares \$1 par. Geo. W. Weatherbee, president; A. L. Sweetser, secretary and treasurer; E. W. Perry, general manager. Lands, 7 claims, in the Index district of Snohomish county, Washington.

LAKE SUPERIOR MINE.**MICHIGAN.**

Lands, 640 acres, in Sections 13 and 14, Town 50 N., Range 39 W., Ontonagon county Michigan, carrying the northeasterly continuation of the parallel cupriferous beds of the Evergreen belt opened in the Mass and Adventure mines. Long idle.

LAKE SUPERIOR & ARIZONA MINING & SMELTING CO.**ARIZONA.**

Office: Calumet, Mich. Mine office: Florence, Pinal Co., Ariz. Employs about 30 men. Organized Sept. 30, 1902, under laws of Arizona, with capitalization \$200,000, shares \$1 par. Title changed, 1904, from Lake Superior & Arizona Mining Co. John D. Cuddihy, president; Dr. W. A. Holt, vice-president; A. E. Petermann, secretary; Wm. B. Anderson, treasurer; Alfred C. Sieboth, superintendent; Henry Richardson, engineer. Lands, 6 claims, area 110 acres, in the Pioneer district, formerly known as the Golden Eagle group, worked for gold by the Gem Gold Mining Co., which went out of business in 1885, after paying considerable dividends. Property is much gophered by numerous short tunnels and pits, whence former owners extracted rich ores in a random manner. Final payment of \$31,000 on lands was made Nov. 30, 1903. Property shows 3 copper ore bodies, of which 2 are being developed, these being fissure veins, averaging 6' in width, mainly in limestone, near a quartzite contact. The main vein, 6' to 7' wide, has a quartzite footwall and dips at about 35°. Ore carries gold and silver values and free gold has been found in the shaft. Ores are mainly oxides and carbonates, associated with iron and manganese, hence highly silicious and ferruginous, and valuable for fluxing the sulphide ores undoubtedly existing at greater depth. Mine is opened by a 279' vertical shaft, sunk in low ground, cutting diagonally through about 30' of ore. There are also three tunnels, known as the Anderson, Carlton and Holt, of 200', 250' and 500' length, one showing about 18' of good ore, said to average 36% copper, with good gold values. The mine has about 5,000' of openings, and the ground is soft, requiring heavy timbering. Equipment includes steam plant, 12-drill Rand air compressor and power drills. Mine is served by the Phoenix & Eastern railroad, distant 18 miles, with good wagon-road connection. Ore shipments were made for several months to the Val Verde smelter, until burned, and excellent returns secured. The mine has several thousand tons of high-grade ore in sight, and 27 tons shipped in October, 1904, gave returns of \$1,616.

LAKE SUPERIOR & BISBEE DEVELOPMENT CO.**ARIZONA.**

Office: Calumet, Mich. Mine office: Bisbee, Cochise Co., Ariz.

LAKE SUPERIOR CONCENTRATING CO.**MICHIGAN.**

Office and works: Houghton, Houghton Co., Mich. Has a 500-ton sludge plant, on the old Franklin stamp sands. Idle.

LAKE SUPERIOR COPPER & ZINC CO.**ONTARIO.**

Letter returned unclaimed from former office, 20 Broad St., New York.

LAKE SUPERIOR GOLD MINING & MILLING CO.**MEXICO.**

Office: Marquette, Mich. Mine office: La Cananea, Sonora, Mex. Capitalization \$3,500,000, shares \$5 par. W. H. Laidley, president; Geo. S. Barnes,

secretary; F. H. Begole, treasurer; Jas. Hooper, superintendent. First lands, 1,200 acres, near Magdalena, Sonora, Mexico, were abandoned, and operations transferred to a group of claims, area 900 acres, in the Cananea Mountains, showing copper ores.

LAKE SUPERIOR & PITTSBURG DEVELOPMENT CO. ARIZONA.

Succeeded, June 1, 1904, by Lake Superior & Pittsburg Mining Co.

LAKE SUPERIOR & PITTSBURG MINING CO. ARIZONA.

Office: Calumet, Mich. Mine office: Bisbee, Cochise Co., Ariz. Employs about 200 men. Chas. Briggs, president; James Hoatson, vice-president; Peter Ruppe, treasurer; Gordon R. Campbell, secretary; James E. Fisher, assistant secretary; preceding officers, Thos. F. Cole, Chester A. Congdon, Charles d'Autremont, Jr., Thos. Hoatson and Geo. E. Tener, directors; Samuel A. Parnall, superintendent. Organized May 11, 1902, under laws of Arizona, with capitalization \$400,000, shares \$10 par, as the Lake Superior & Pittsburg Development Co.; name changed, 1904, to present title, and capitalization increased to \$3,000,000, shares \$10 par; issued, \$2,500,000, fully paid. Lands, 46 claims, area 640 acres.

Possible litigation over titles was obviated by allowing shareholders of the old South Bisbee Copper Mining & Townsite Improvement Co. to subscribe for 20,000 shares at par, practically giving them a bonus of \$800,000, but obviating all possibility of future land litigation.

The mine has two shafts, and a third may, and doubtless will, be sunk later, on the southeastern part of the company's extensive tract. The principal opening is the Cole shaft, formerly known as No. 2. This was sunk nearly 1,000' by former owners, and is being straightened, retimbered and cut down from 2 small compartments to 4 large compartments of full working size, 8x24' outside of timbers. The work was begun simultaneously on 10 levels, and is being performed in record-breaking time. The work should be completed in March or April, 1905. This shaft is 1,150' deep and connected by long drifts with No. 3 shaft, 900' deep, on the Uncle Sam claim, some distance southward. The Cole shaft has Prescott and Cameron station pumps, caring for a present flow of 225 gallons per minute and capable of much heavier duty. It is obvious that the Briggs shaft of the Calumet & Pittsburg is caring for a considerable part of the normal water supply of the Cole shaft. Immense ore bodies have been opened on the 900', 1,000' and 1,100' levels, notably the latter. The ores are similar as to occurrence and nature to those of the Copper Queen and Calumet & Arizona, of which the L. S. & P. ore bodies are the southerly continuation, and the 1,100' level shows long stopes of ore ranging in copper tenor from 7% to 30%, with small gold and silver values.

The surface plant is at the Cole shaft, and includes boilers, a single drum Sullivan hoist, timber-mill, smithy, office, changing-house, etc.

The management is of the best, and the Lake Superior & Pittsburg gives every promise of making one of the very largest and richest copper mines ever opened. So vast are its possibilities that a forecast based upon absolutely correct data might be received with suspicion as a gross exaggeration.

tion. It may be said, however, with perfect safety, that the Lake Superior & Pittsburg gives every indication of making a better mine than the Calumet & Arizona, which already ranks among the ten largest copper producers of the world.

LAKE SUPERIOR POWER CO.

ONTARIO.

Office: Sault Ste. Marie, Ont. Mine office: Gertrude Mine, via Sudbury, Ont. A subsidiary corporation of the Consolidated Lake Superior Co., which suffered in the debacle of that ill-starred concern. Thos. Travers, superintendent; Ernst A. Sjöstedt, mining engineer; Thos. Williams, mining captain. Lands, 7 claims, area about 2,000 acres, including the Gertrude and Elsie nickel-copper mines, in Creighton township, Algoma, Ontario, showing four contact veins carrying cupriferous and nickelferous pyrrhotite. Has shafts of 50', 60', 80' and 100', with about 1,000' of underground openings. Estimated ore in sight, 500,000 tons; blocked out for stoping, 50,000 tons. Has steam plant, with 7 tubular boilers and 4 hoists. Has a smelter connected with mine by the Manitoulin & North Shore railway, with 150-ton Herreshoff water-jacket furnace, making matte averaging 10% copper and 20% nickel, when in blast. Idle.

LAKE SUPERIOR SMELTING CO.

MICHIGAN.

Office: 199 Washington St., Boston, Mass. Works office: Dollar Bay, Houghton Co., Mich. H. B. Conant, superintendent; Joseph Thebo, assistant superintendent; J. C. Dunstan, clerk. Plant includes smelters at Dollar Bay and Hancock, former being the larger and more important. The Dollar Bay plant is closely connected with the works of the Tamarack-Osceola Copper Mfg. Co. The Lake Superior Smelting Co. is controlled by the so-called Bigelow mines, those being the Tamarack, Osceola, Isle Royale and Ahmeek. Works employ about 300 men.

SUCESION C. J. LAMBERT.

CHILE.

Mine office: Brillador, La Serena, Coquimbo, Chile. Operates La Compañía mine, opened 1850, making 500 to 700 tons of refined copper yearly. Also owns the Bronces mine, 550' deep, opened 1840, now idle, and has an extensive smelting plant, employing about 500 men.

ERZBERGWERK LAMPERTUS.

GERMANY.

Mine office: Hohenstein-Ernstthal, Saxony, Germany. Friederich Wilhelm Feltzner, president. Property carries arsenical, auriferous and argenterous ores of copper. Employs 12 men.

LANCELOT FREEHOLD TIN & COPPER MINES, LTD.

AUSTRALIA.

Offices: 1, Bucklersbury, London, E. C., Eng. Mine office: Herberton, Queensland, Australia. Organized May 27, 1903, with capitalization £120,000, shares £1 par; issued, £95,566. Debentures, £20,000 authorized, £19,250 issued, at 10%. Is a reorganization of the Lancelot Tin Mining Co., Ltd. F. E. Clotten, chairman and managing director; G. A. Waller, mine manager; F. J. Duck, secretary. Lands, 60 acres freehold and 160 acres leasehold, carrying ores of copper, tin, bismuth and wolfram, opened by a 327' main shaft and a 150' tunnel. Is developing steadily and is securing a small production of tin and bi-muth.

LARDEAU-DUNCAN MINES, LTD.

BRITISH COLUMBIA.

Office: 5 Wolverton Blk., Spokane, Wash. Organized under laws of British Columbia, with capitalization \$150,000, shares 10c. par. John MacKenzie, president; A. H. Wheatley, secretary and treasurer. Lands, 3 claims area 150 acres, with 4 adjoining claims under option, on Cariboo Creek, in the Lardeau-Duncan district of British Columbia, showing a quartz vein carrying gold, copper, silver and zinc, with a strong gossan capping carrying a little azurite. Development is by open cut and a short tunnel, showing ores returning average assay values of \$19 per ton, mainly in gold and copper.

LAS ADARGAS MINING CO.

MEXICO.

Office: 15 John St., New York. Mine office: Jiminez, Chihuahua, Mex. Claims to be organized under laws of New York, with capitalization \$1,000,000, shares \$10 par. E. G. Seiler, president; Geo. E. Crawford, secretary; W. A. Seamon, general manager, El Paso, Texas. Has a 300' shaft. Declared a dividend of 25 cents per share, April, 1902. Property said to be held under a bond of \$300,000, on which \$15,000 has been paid.

LAS ANIMAS COPPER MINING & SMELTING CO., LTD.

CHILE.

Offices: 2, Rumford Pl., Liverpool, England. Mine office: Chañaral, Atacama, Chile. Archibald Boxburgh, chairman; Pedro Nicolas Schjölberg, managing director in Chile; F. E. Owens, secretary; Guillermo Sheriff, mine manager. Organized Jan. 3, 1902, with capitalization £20,000, shares £1 par; issued, £15,000, succeeding the Copper Corporation of Chili, Ltd. Lands, 608,500 sq. yds., including the Fortunata mines, 430' deep, opened 1855, Alena and Progreso mines, at Las Animas, and smelting plant at Chañaral, which was blown in March 3, 1902. Production for 1903 was 27,384 metric tons of ore, yielding 2,671 metric tons matte of 61% copper tenor, equal to 3,701,976 lbs. fine copper, a return of nearly 6% from the ores smelted.

LAS ANIMAS GOLD-COPPER MINING CO.

NEW MEXICO.

Office: 50 State St., Boston, Mass. Mine office: Hillsboro, Sierra Co., N. M. Organized 1900, under laws of West Virginia, with capitalization \$1,000,000, shares \$1 par. Jas. P. Mallette, president and general manager; Wm. T. D. Treefry, secretary and treasurer; W. W. Williams, superintendent; L. W. Getchell, consulting engineer. Lands, 4 claims, in the Hillsboro district, 22 miles from nearest railway, showing a fissure vein averaging 8' wide, with length of 3,500' and giving assays up to 10% copper, 15 oz. silver and 2 oz. gold per ton, from oxide and sulphide ores. Has shafts of 150' and 400', and 3 tunnels, with 4,000' of underground openings, estimated by company to give 100,000 tons of ore in sight and 60,000 tons blocked out for stoping. Has steam and gasoline power, with hoist good for depth of 1,000'.

LAS ANIMAS MINING & SMELTING CO.

MEXICO.

Mine office: Altar, Sonora, Mex. Lands include Las Animas, Purgatorio and other mines carrying copper ores. Has steam power and employed a small force on development work at last accounts.

LAS MORES COPPER CO.**MEXICO.**

Mine office: Ameca, Jalisco, Mex. G. E. McCormick, president and general manager. Has argentiferous copper ores of good grade.

LAS PLAYAS-SINALOA MINING CO.**MEXICO.**

Office: care of Geo. B. Clark, Commonwealth Trust Bldg., St. Louis, Mo. Apparently is a subsidiary or collateral corporation of the Sinaloa Exploration Co.

LAS TUSAS MINING & MILLING CO.**NEW MEXICO.**

Mine office: Tres Piedras, Rio Arriba Co., N. M. Lon. L. Trout, general manager. Has auriferous copper ore, with steam power, and employed about 20 men at last accounts.

LAS VEGAS COPPER CO.**NEW MEXICO.**

Office: East Las Vegas, N. M. Capitalization \$100,000, shares \$1 par. F. A. Manzanares, president; J. M. Thompson, secretary; J. M. Allen, treasurer and general manager; Frank J. Buck, consulting engineer. Property is the Tecolote mine, in San Miguel county, New Mexico, showing auriferous and argentiferous copper ore, also a vein of bluestone or natural copper sulphate. Has steam and electric power, and concentrator, employing about 40 men at last accounts. Company claims to have developed about 5,000,000 tons of carbonate ore.

LAS VIGAS MINING CO.**MEXICO.**

Office: care of Geo. E. Voorhees, Jr., Santa Barbara, Cal. Mine office. Las Vigas, Coyame, Chihuahua, Mex. Employs 48 men. Carlos P. Halter, general manager. Lands, 74 pertenencias, area 173 acres, showing 19 ore bodies, as fissures in sandstone and as contacts between sandstone and what is probably clay-alate, ores occurring as impregnations and replacements in the sandstone. Four of these bodies are being developed, these averaging 7' to 12' width and giving average returns of 7.5% copper and 3 oz. silver per ton, mainly from bornite and chalcopyrite, with occasional oxides, carbonates and native copper. Has shafts of 61', 98', 125' and 179', with 3 short tunnels, estimated to develop 60,000 tons of ore. Property was formerly worked by the Spaniards. Has steam power, hoists and air compressor. Buildings include office, store and 19 dwellings. Ore is hauled by a Buffalo-Pitts traction engine to Las Trancas station, 43 miles distant, on the Kansas City, Mexico & Orient railroad. Production of refined copper in 1902 was about 65 tons and for 1903 reached about 150 tons. Plans of management call for vigorous development and erection of a smelter as soon as an assured tonnage is developed.

LAST CHANCE COPPER MINING CO.**WASHINGTON.**

Mine office: Keller, Ferry Co., Wash. Presumably idle.

LAST CHANCE MINING CO.**ARIZONA.**

Succeeded by Canyon Copper Co.

LATHAM MINING & SMELTING CO.**NEVADA.**

Office: 224 D. F. Walker Bldg., Salt Lake City, Utah. Mine office: Sprucemount, Elko Co., Nev. Organized under laws of Utah, with capitalization \$1,000,000, shares \$1 par. V. J. Yunck, president; Geo. L. Sigler,

vice-president; Geo. L. Moates, treasurer and general manager. Lands, 8 claims, area 160 acres, 48 miles south of Wells, showing 7 fissures giving average assay values of 7% copper and 7 oz. silver per ton, also a promising silver-lead vein opened by a 400' shaft and tunnels of 700' and 900', with about 3,000' of underground openings. Has a 50-ton concentrator, and smelter with 3 small water-jacket furnaces. Said to plan installation of a dry concentrator.

LATIMER COPPER MINING CO.**GEORGIA.**

Mine office: Pierceville, Fannin Co., Ga. Idle.

LATOUCHE MINING CO.**ALASKA.**

Office: 10 Wall St., New York. Mine office, Valdez, Alaska. Organized 1902, under laws of New Jersey, with capitalization \$100,000. Andrew K. Beatson, general manager. Lands, sundry claims, on the mainland, opposite Latouche Island, some 60 miles south of Valdez, about ½ mile from a good natural harbor, on tidewater. Though but little mining work has been done, the showing secured is considered favorable, and Beatson's reputation in Alaska is that of an honest man.

LATOUCHE ISLAND COPPER MINING CO.**ALASKA.**

Office: 49 Sullivan Bldg., Seattle, Wash. Jas. A. Murphy, president; Solon T. Williams, secretary; R. L. P. Wallace, treasurer. Organized under laws of Washington, with capitalization \$5,000,000, shares \$5 par. Lands, 29 claims and a millsite, on Latouche Island, Prince William Sound, Alaska, about 60 miles south of Valdez, not far from tidewater. Development is by a 75' tunnel, showing chalcopyrite and bornite. Company refuses to give information in response to requests, though asking the public for cash to finance the property, a policy utterly opposed to sound business principles.

LAURA-PEARL MINING & MILLING CO.**COLORADO.**

Mine office: Newett, Chaffee Co., Colo. F. H. Denman, superintendent. Ores carry gold, silver and copper. Has steam power.

LAURIUM MINING CO.**MICHIGAN.**

Office: 301-199 Washington St., Boston, Mass. Mine office: Laurium, Houghton Co., Mich. Organized under laws of Michigan, with capitalization \$1,000,000, shares \$25 par. Annual meeting, second Tuesday in June. A. S. Bigelow, president; W. J. Ladd, secretary and treasurer; Wm. E. Parnall, superintendent. Lands, approximately 575 acres of mineral rights, and approximately 325 acres of surface rights, being the remainder of surface and mineral rights to 640 acres lying next east of the Calumet & Hecla, upon which the village of Laurium has been built, with all mineral rights reserved, except a triangular patch of about 65 acres, of both surface and mineral rights, sold many years ago to the Calumet & Hecla. This tract must carry the southern extension of the Kearsarge lode, and diamond drilling to locate it was begun June 10, 1904. The third deep hole was nearing completion at the close of 1904, and the company probably will secure a complete geological cross-section during 1905. Mining on the Kearsarge lode will be started, should that bed prove promising.

L'ETETE GOLD & COPPER MINING CO. NEW BRUNSWICK & NOVA SCOTIA.

Mine office: L'Etete, Charlotte Co., New Brunswick. Property is the old Johnston mine, opened circa 1860, reopened 1902, having two short tunnels and a 145' main shaft showing ore of good assay value. Has steam plant, and shipping facilities at tidewater. Company also owns mineral lands in Nova Scotia.

LE ROI MINING CO., LTD.

BRITISH COLUMBIA.

Office: 541, Salisbury House, London, E. C. Eng. Mine office: Rossland, B. C. Employs about 400 men. Sir Henry W. Tyler, chairman; L. C. F. Robson, secretary; A. J. McMillan, managing director and general manager; J. W. Astley, general superintendent; A. J. Trevorow, mine superintendent; A. I. Goodell, smelter superintendent; W. S. Rugh, chief mine accountant. Organized June 7, 1898, with capitalization £1,000,000, shares £5 par. Has paid total dividends of 10%, last dividend of 5% being paid in 1900. Is said to have earned considerable profits in 1904, estimated at £10,000 per month during last few months of year.

Lands, 71 acres, also the I. X. L. mine held under lease. Ore body is narrow at top and wide at bottom, but values decrease at depth. Main shaft has 4 compartments and is 1,450' deep, mine showing reserves of about 500,000 tons of ore, and diamond drill holes, bored from the bottom of the shaft, prove a continuance of the vein to greater depth. Bottom of mine shows 3' to 5' of good shipping ore, averaging about \$20 per ton in value. Property has a good mining equipment, including hoists, air compressors, power drills, shops, steam shovel and sampling mill.

The reduction plant, at Northport, Washington, 17 miles from the mine, is held in the name of the Northport Smelting & Refining Co., Ltd. This is a very complete and modern plant of 1,200 tons daily capacity. Limestone for flux is secured from the company's quarry, only 4 miles distant, and water is supplied from Deep Creek, through a 3-mile flume 4x5' in size leading to two 125,000-gallon storage tanks, whence water is brought in pipes, under a head of 145', actuating 18" and 24" Pelton Water wheels under an effective pressure of about 60 lbs.

The bulk of the ores treated are roasted before charging. Ore is received by rail and dumped into ore bins of 1,600 tons capacity, elevated 17' above the roast-yard, which is 500x500'. Ore is trammed to the roast-yard on temporary trestles and roast-heaps are built about 125x350', and approximately 15' high, each roast-heap containing about 24,000 tons and requiring 6 weeks for burning. The roasting reduces the sulphur content from 10% to about 3.5%. Wood consumption averages 1 cord per 50 tons of ore. After burned, the ore is removed from the roast-yard by a steam-shovel, handling about 600 tons daily, and is hauled up an incline in self-dumping cars to the roasted ore bunkers by a small locomotive.

The reduction plant includes a 70x98' sampling mill, with Vezin samplers. The calcining building, 72x350', has two 35-ton 10x100' single-deck Holthoff-Wethey furnaces and a smaller double-deck furnace. The blast-furnace

building is 69x240', with a southern annex of 55x69' for the silica-mill, and a northern annex of 69x100' for the power plant. There are 6 water-jacket blast furnaces, with mechanical feed, two being 38x120" in size; one 40x160" and three 42x160", latter with daily capacity of 300 to 400 tons each. The furnace charges are mixtures of raw and roasted ore, with limestone and coke.

The power plant at the smelter includes a 400-h. p. Allis-Chalmers engine, two smaller engines, 6 Connorsville blowers, 500-light Westinghouse dynamo, and five 250-h. p. Heine boilers. The brick dust-chamber, 10x11x428', has a hopper bottom and side discharge gates. Flue-dust is briquetted, with lime for a binder, in two White mineral presses, and resmelted. The main brick 'smokestack is 182' high, and 10' square, and there are two smaller brick stacks. Slag is granulated and washed into the Columbia river. The first-fusion product is a 25% matte, which is roasted, granulated, briquetted and blown up to 50% matte, carrying considerable gold values and small silver values, which is shipped to New York for conversion and refining. In addition to treating Le Roi ores, the Northport smelter does considerable custom business.

For the fiscal year ending June 30, 1904, production was 160,109 dry tons of first-grade ore, of the gross value of \$1,752,024, equal to \$10.94 per ton, and 19,013 tons of second-grade ore, worth \$143,078, equal to \$7.52 per ton. Production of copper, for fiscal year 1902, was about 4,750,000 lbs. refined copper. The prospects of the property have improved greatly during the past 18 months, and the Le Roi should be able to pay a dividend during 1905.

LE ROI NO. 2, LTD.

BRITISH COLUMBIA.

Offices: Salisbury House, London, E. C., Eng. Mine office: Ross-land, B. C. Employs about 200 men. Organized June 1, 1900, with capitalization £600,000, shares £5 par. Has paid dividends of £66,000, last being 1% in 1903. Lord Ernest Hamilton, Chairman, F. A. Labouchere, secretary; Ernest Levy, manager; R. R. Cormack, assistant manager; Alex. Hill and Stewart, consulting engineers. Lands, 72 acres, including the Josie and No. 1 mines, in addition to which the company holds working bonds, under option of purchase, on the Thompson, Vernon, Eureka and Evening claims. The mine is about 600' deep, the Josie showing a new and important ore body on the 500' level, with indications of even better values on the 600', or bottom, level. During 1904 the company did 3,617' of diamond drilling, in 26 holes. Ores carry values in gold, copper and silver, in order named. Ores are graded into two classes, for smelting and concentrating, and ore reserves have been estimated at 300,000 tons, which seems rather high. Largest copper production was 3,001,027 lbs in 1902, falling to 980,000 lbs. in 1903 and about 1,200,000 lbs. in 1904, latter secured from 22,673 tons of ore treated.

Late in 1903 an Elmore oil concentrator, fully described in Vol IV., was installed. This proved a technical but not a commercial success, and has been superseded by Wilfley tables. The reasons for this outcome were

several in number, among them being an advance in the price of oil, the extremely low-grade of the tailings handled, and last, but probably most important, the small supply of material, which averaged only about 20 tons daily for a 50-ton plant, placing this interesting new process at a great disadvantage in tonnage costs. It is to be hoped the Elmore oil process may be given a fairer and more exhaustive test on low-grade tailings, where its technical advantages may be supplemented by fairer conditions.

Ores and concentrates are shipped to the Greenwood works for smelting. Mining costs, for the fiscal year ending Sept. 30, 1904, were \$4.46 per ton, compared with \$5.30 for the preceding year, and small net profits were secured on operations. The property is one of considerable value, but will require careful handling, if it is to afford substantial returns to shareholders, from the low-grade ores now being mined.

LE ROY MINING CO.

MEXICO.

Office: Pilares de Teras, Sonora, Mex. Lee Benton, manager. Ores carry silver, gold and copper. Property was in process of development, at last accounts.

LEACLEDE CONSOLIDATED GOLD & COPPER MINING CO.

OREGON.

Office: 518 Broadway, Albany, N. Y. Mine office: North Powder, Union Co., Ore. Organized June 10, 1900, under laws of Oregon, with capitalization \$1,500,000, shares \$1 par. H. Earle Furman, president; Geo. Oliver, vice-president; W. J. Curtis, secretary; Chas. E. Lansing, treasurer; W. N. Gardner, mine manager. Lands, 160 acres, well timbered and opened by several hundred feet of shafts, tunnels and crosscuts, showing several parallel veins of 10" to 4' width giving ores assaying 10% copper, with good gold and silver values. Ore is highly ferruginous, rendering it desirable as a flux for ores deficient in iron. Idle.

LEAD KING MINE.

COLORADO.

Mine office: Crystal, Gunnison Co., Colo. T. P. Lamoy, operator, under lease, shipping about 100 tons of ore monthly that gives average smelter returns of 25% zinc, 9% copper, 8% lead and 20 oz. silver.

LEEDS COPPER CO., LTD.

QUEBEC.

Letter returned unclaimed from former offices, 11, Bloomfield St., London, E. C., Eng.

LEIGHTON-GENTRY COPPER CO.

WYOMING.

Title changed, 1904, to Independence Mining Co.

LENA MINING CO.

NEW MEXICO.

Letter returned unclaimed from former mine office, Lordsburg, N. M.

LENORA COPPER MINING CO.

BRITISH COLUMBIA.

Same as Lenora-Mount Sicker Copper Mining Co., Ltd.

LENORA MINING & MILLING CO.

UTAH.

Office: care of P. C. Evans, secretary, Salt Lake City, Utah. Mine office: Milford, Beaver Co., Utah. Organized December 19, 1903. Miles L. Burns, president; J. D. Carpenter, general manager. Lands, 9 claims, known as the Lenora group, in Beaver county, Utah.

**LENORA-MOUNT SICKER COPPER
MINING CO., LTD.****BRITISH COLUMBIA.**

Office: Victoria, B. C. Mine office: Duncans, Vancouver Isld., B. C. Organized 1898, and in liquidation 1904. W. Buxton, superintendent. Lands, adjoining the Tyee, on Mt. Sicker, show a continuation of lenses in a chute of 30' to 40' width, with strong gossan capping. Ore produced is divided into two grades, first grade averaging 7.95% copper, 3.57 oz. silver, and 0.17 oz. gold; second grade, which is about two-thirds of the total production, averages 2.3% copper, 1 oz. silver and 0.05 oz. gold. Ore goes to the Crofton smelter over a narrow-gauge railway. Despite the financial troubles of the company, due largely to attempting to do too much with a small capital, the property is regarded as decidedly promising.

MINAS LAS LENORA y HUERTA.**MEXICO.**

Office: Apartado 16, Aguascalientes, Mex. Mine office: Villanueva, Zacatecas, Mex. G. M. Daniel, general manager; J. M. Daniel, Jr., superintendent and engineer; Manuel Varila, mine superintendent. Lands, 100 acres, also 500 acres of miscellaneous lands, in the Jalpa district, showing a fissure vein in porphyry, of 10' average width, carrying argentiferous galena, argentite, malachite and azurite, with clay gouge, giving average returns of about 5% copper, 10% lead, 200 oz. silver and 29 miligrams gold per ton. Has shafts of 300' and 1,000', with about one mile of underground openings. Was opened by the Spaniards, about 1820; reopened 1883. Has steam power and concentrator with 1 crusher and 12 planillas, for treating low-grade ores. Concentrates and smelting ores are shipped 75 miles, by burros, to the plant of the American Smelting & Refining Co., at Aguascalientes. Employs about 150 men.

LERIDA COPPER MINES CO., LTD.**SPAIN.**

Office: care of Don Tomás Cinnamond, agent, Barcelona, Spain. Lands, 314 hectares, including the Recuerdo and other mines, at Torre de Capdella, Lérida, Spain.

LERIDA COPPER MINES, LTD.**SPAIN.**

Wound up voluntarily, September, 1902.

SOCIEDAD ANONIMA MINERA BELGA DE LOS COBRES**SPAIN.****DE LERIDA y GRANADA.**

Wound up voluntarily, September, 1902.

LESLIE COPPER MINING CO.**IDAHO.**

Supposed to have copper claims somewhere west of Saltese, Idaho, but letter returned unclaimed from that place.

LEVANT MINING CO., LTD.**ENGLAND.**

Offices and mines: St. Just, Cornwall, England. A cost-book company with 2,385 shares. T. R. Bolitho, chairman; Maj. R. White, secretary. Mine produces tin and copper, mainly the former, and has been continuously worked since 1820, and paid £170,000 in dividends during its first 20 years of operation.

LEVIATHAN MINE.**CALIFORNIA.**

An idle property, 10 miles east of Markleeville, Alpine Co., Cal. Ore occurs as lenses, in porphyry, opened by tunnels of 400' and 700'.

LEXINGTON MINE.**MONTANA.**

Office and mine: care of F. August Heinze, lessee, Butte. Silver Bow Co., Mont. Property is owned by Georges de la Bouglise, of Paris, and has been worked in a small way, on upper levels only, for silver by Louis Girard, for several years past. Lands, 8 claims, lying west of the Cora and Rock Island mines of the United Copper Co. Main shaft, 1,465' deep, is being unwatered and retimbered, which work will require nearly till end of 1905. Is connected underground with the Alice and Moulton mines, which must be unwatered at the same time as the Lexington. Shaft is to have a large new wooden gallows-frame, and hoist good for 2,500' depth. Is held by Mr. Heinze under an 18-month bond and lease providing that production shall be applied on payment. Was worked many years for gold and silver values, but below 1,400' level there is a 30' vein with granitic gangue carrying stringers of sulphide ore averaging 3% to 4% copper.

LIBERTY COPPER MINING & MILLING CO.**MARYLAND.**

Mine office: Libertytown, Frederick Co., Md. Capitalized at \$2,000,000. Thos. E. Ludlam, president; M. C. Stafford, secretary. Owns the old Liberty mine, long idle, which has a variety of ores, including chalcocite, tenorite, tetrahedrite, bornite and malachite.

LIBERTY MINING & SMELTING CO.**ARIZONA.**

Mine office: Tucson, Pima Co., Ariz. Wm. R. Wemple, manager. Ores carry silver, lead and copper. Has gasoline power.

LIBIOLA COPPER MINING CO., LTD.**ITALY.**

Offices: 16, Leadenhall St., London, E. C., England. Mine office: Sestri Levante, Liguria, Italy. Kenneth Haweis James, chairman; W. S. Bartlett, secretary; Robt. H. Craven, mine manager. Reorganized 1888, with capital £252,000, shares £5 par. Has paid dividends of £4 2s. 6d. to close of 1904, dividends being 2s. 6d. annually, in 1901 and 1902 and 1s. interim in 1903 and 1904. Company has a heavy share interest in the Cruccuen silver-lead mine, Sardinia, now idle, and owns the Libiola copper mines in Liguria, northern Italy. Ore of latter is mainly low-grade chalcopryite, occurring as veins in serpentine and diabase, the mines showing large bodies of ore. Property was discovered and worked by the Romans and was reopened in 1867. Production in 1902 was 4,564 long tons of ore, averaging 4.75% copper, equivalent to 485,385 lbs. of refined copper, and 22,727 tons of iron pyrites averaging 47.5% sulphur and in 1903 was 4,219 long tons of ore averaging 5.971%, equal to 564,292 lbs. fine copper, and 23,575 tons iron pyrites averaging 47.5% sulphur. Ore reserves are about 100,000 tons of pyrites and 6,000 tons of copper ore. This property, while low in grade, has extensive ore bodies, and by careful management is made to yield fair profits.

SOCIETA ANONIMA PER L'ESERCIZIO DELLA MINIERA DE LIBIOLA. ITALY.

Mine is worked by Libiola Copper Mining Co., Ltd.

SOCIETE DES MINES DE LA LIENNE. ITALY.

Mine offices: Alagna and Riva, Circondario di Varallo, Novarra, Italy. Ore is medium grade chalcopryite. Was working on a limited scale at last accounts.

SOCIETE LIGURE RAMIFERA. ITALY.

Mine office: Casarza, Genoa, Italy. Mines include the Fontanelle, Rio Albareta, Rio Monticelli and Rio dei Fichi. Ore is chalcopryite, in quartzose gangue. Mines are producing on a limited scale.

LILLY MINING & MILLING CO. COLORADO.

Mine office: Idaho Springs, Clear Creek Co., Colo. F. F. Reed, superintendent. Ores carry gold, silver, lead and copper. Has steam power.

LILYAMA MINE. CALIFORNIA.

Office: care of Robt. Crocker & Co., Placerville, Cal. Lands, 240 acres, unpatented, in El Dorado Co., Cal., 11 miles from Auburn. Ores, mainly sulphides, occur as lenses in limestone lying between granite and quartz-porphry. Has four tunnels and a prospecting shaft.

LIMA COPPER MINING SYNDICATE, LTD.

Offices: 8, Union Court, Old Broad St., London, E. C., Eng. J. Harris, chairman; T. Simpson, secretary. Location of property, if any, unknown. **LIME CREEK CONSOLIDATED GOLD & COPPER CO. ARIZONA.**

Office: 5 Creighton Bldg., Phoenix, Ariz. Capitalization \$500,000. A. J. Edwards, president; J. D. Marlar, secretary; Wm. E. Marlar, superintendent. Lands, 480 acres, called the Copper Top mine, lying 60 miles northeast of Phoenix, some distance from a railroad, held on bond and lease. Has a considerable ore body, giving assays of 5% to 40% copper and \$8 to \$10 gold per ton, and is developed by several shafts and tunnels. Has 10-ton and 60-ton smelters at the mine and a 30-ton smelter at Alhambra, 6 miles west of Phoenix. Employs 10 men, and enjoys good local standing.

COMPANIA LIMITADA. CHILE.

Operates the Fundicion Templeman mine, opened in 1897, in department of Antofagasta, Chile, producing therefrom about 1,500 tons of refined copper yearly, according to returns to state department of United States.

LINARES MINING SYNDICATE, LTD. SPAIN.

Mine office: Linares, Jaen, Spain. S. Moos, manager. Organized, early in 1903, to exploit lead, copper, zinc, iron and coal properties in the vicinity of Linares. Company said to plan constructing a large warehouse and shipping pier at Almeria, Spain.

LINCOLN MINE. UTAH.

Mine office: Minersville, Beaver Co., Utah. Gus Stoney, superintendent. Ores carry silver, lead and copper. Mine is opened by shaft, and has steam power. Presumably idle.

LINCOLN CONSOLIDATED MINING CO.**ARIZONA.**

Office: 155 La Salle St., Chicago, Ills. Mine office: Tucson, Pima Co., Ariz. Organized under laws of Arizona, with capitalization \$2,000,000, shares \$1 par. Dr. Chas. Caldwell, president; Jas. M. Melville, vice-president; E. W. Brinker, secretary. Lands, 34 claims, and a millsite, area about 700 acres, in the Sierrita range of mountains about 30 miles southwest of Tucson. Development is by about 50 pits, shafts and tunnels, mostly shallow pits. The Providence claim is opened by a 520' tunnel, exposing rich ore, from which smelter shipments have given average returns of about 20% copper, with considerable gold and silver values. Country rocks are granite, schist and limestone, showing 8 fissure veins of workable size, carrying sulphide ores of copper and lead, with good gold and silver values. Property has shipped about \$80,000 worth of ore. Mine has been favorably reported on by H. B. Sturtevant, an engineer of very high standing.

LINCOLN COPPER CO.**ARIZONA.**

Succeeded by the Lincoln Consolidated Mining Co.

LINCOLN COPPER DEVELOPMENT CO.

Office: 326 Post St., San Francisco, Cal. Location of property, if any, not learned. Address of company regarded with suspicion, owing to being the hiding place of a swarm of extremely dubious mining propositions put out by one "Baron" W. E. Van Johannsen, a notorious grafter.

LINCOLN COPPER MINING CO.**ARIZONA.**

Office: 321 Spruce St., Aurora, Ills. Capitalization \$3,000,000, shares \$1 par. Lands, 42 claims, area about 850 acres, in the Sierrita Mountains. It is evident that this is the property now held by the Lincoln Consolidated Mining Co. The Arizona Lincolns are of uncertain pedigree and devious affiliations.

LINCOLN COPPER MINING CO.**MONTANA.**

Incorporated July, 1903, under laws of Montana, with capitalization \$1,500,000, shares \$1 par. Among incorporators given was Thos. H. Carter, but Senator Carter writes that he knows nothing about the company. Lands, said to be 10 claims, in the Little Boulder district, about 30 miles from Helena, Lewis and Clarke Cos., Montana.

LINCOLN MINING & MILLING CO.**COLORADO.**

Mine office: Idaho Springs, Clear Creek Co., Colo. J. M. Dumont, superintendent. Ores carry gold, silver, copper and lead. Has steam power and 15-stamp mill.

MINA LINEA DIVISORIA.**CHILE.**

Mine office: Chañaral, Atacama, Chile. Braniff y Roldan, owners. Employs about 25 men.

LINEDALE WEST CHILLAGOE, LTD.**AUSTRALIA.**

Offices: 47, Queen St., Melbourne, Australia. Mine office: Arboin, Chillagoe, Queensland, Australia. Capitalization, £16,500, shares £5 par. C. W. Chapman, chairman; Thos. Rollason, secretary; E. Reeves, mine manager. Lands, 19 claims, area 440 acres, in the Herberton district, showing a 7' vein, with a 3' pay-streak carrying 20% copper, 10 oz. silver and 2 dwts

gold per ton, on which a limited amount of development has been secured. Operations partially suspended, owing to lack of funds, at last accounts.

LION COPPER MINING CO.

ARIZONA.

Office: 313 West Second St., Los Angeles, Cal. Mine office: Stoddard, Yavapai Co., Ariz. Employs 8 men. Organized February, 1903, under laws of Arizona, with capitalization \$2,500,000, shares \$1 par. Chas. Matthews, president; O. A. Cox, secretary and treasurer; Henry Reifsnnyder, general manager. Lands, 13 claims, area 260 acres, in the Agua Fria district, 6 miles from nearest railroad. Country rocks are limestone, quartzite and dioritic porphyry, showing numerous veins carrying oxide, carbonate and sulphide ores giving average assays of 24% copper, and opened by shafts of 50', 100' and 300', with 515' of underground openings. Has gasoline power, and has bought a diamond drill, which will be used from bottom of the 300' shaft in probing for ore bodies.

LION GOLD MINING & MILLING CO.

COLORADO.

Mine office: Silverton, San Juan Co., Colo. Chas. Newman, superintendent. Ores carry gold, silver and copper. Has steam power.

LITHGOW COPPER SMELTING & REFINING WORKS.

AUSTRALIA.

Office: Equitable Bldg., Sydney, N. S. W., Australia. Works office: Lithgow, N. S. W., Australia. N. Longworth, manager. Is the most important copper smelting plant in Australia, works including furnaces of 400 tons daily capacity, and an electrolytic refining plant. Employs about 300 men.

LITTLE BAY MINE.

NEWFOUNDLAND.

An idle mine on Little Bay, Nfld. Opened 1878, closed 1892. Has a 1,350' main shaft and small smelter, and made considerable copper when worked. Now owned by Carmen Copper Mines, Ltd.

LITTLE BULLY HILL MINING & SMELTING CO.

CALIFORNIA.

Office: San Francisco, Cal. Capitalization \$1,000,000, shares \$1 par. Lands, 5 claims, said to adjoin the Bully Hill mine, opened by a 130' tunnel and several trenches, said to show sulphide ore.

LITTLE GIANT MINING, MILLING & SMELTING CO.

WASHINGTON.

Office: Spokane, Wash. Mine office: Marcus, Stevens Co., Wash. J. B. Reynolds, superintendent. Has auriferous and argentiferous copper ores, with steam power, and employed about 10 men, at last accounts.

LITTLE MATTIE MINING, MILLING & POWER CO.

COLORADO.

Mine office: Idaho Springs, Clear Creek Co., Colo. F. V. S. Leebrick, superintendent. Ores carry gold, silver, lead and copper. Has steam and water power and 20-stamp mill, employing about 35 men.

LIVE OAK COPPER MINING & SMELTING CO.

ARIZONA.

Office: 438 Broome St., New York. Mine office: Globe, Gila Co., Ariz. Organized under laws of Arizona, with capitalization \$1,200,000, shares \$1 par. F. J. Kaldenberg, president; Forest J. Kaldenberg, vice-president and secretary; W. G. Augustin, treasurer. Idle at last accounts.

LIVERMORE GOLD & COPPER MINING CO.

WYOMING.

Letters to former office, Laramie, Wyo., returned unclaimed. Or-

ganized May, 1902, with capitalization \$1,000,000, to take over Cumberland, Empire, Flying Dutchman, and Eureka claims, in vicinity of Laramie.

MINAS LLANOS BLANCOS y LOS PLATOS.

CHILE.

Mine office: Tamaya, Tongoya, Ovalle, Chile. Opened 1903. Main shaft 250' deep. Idle at last accounts.

"LLOYD" COPPER CO., LTD.

AUSTRALIA.

Offices: 195A, Winchester House, London, E. C.; Eng. Mine office: Burraga, County Bathurst, New South Wales. Employs about 350 men. Alexander Creighton Arthur, chairman; W. H. Corbould, acting general manager; L. Malleeson, secretary. Registered May 9, 1899, with capitalization £250,000, shares £1 par; debentures £50,000 authorized, first mortgage. Lands, 318 acres freehold and 375 acres leasehold, in the Bathurst district. Ore is slightly argentiferous chalcopryite, with quartzite gangue, occurring in fissures traversing acid diorite. Main shaft is 1,700' in depth and mine, opened 1877, is developed quite extensively. District is arid and operations are occasionally suspended from lack of water, although the mine has an 85,000,000-gallon storage dam, sufficient for about nine months' supply. The reduction plant, built in 1901, at a cost of £32,000, includes a concentrator and 50-ton smelter with reverberatory furnace, also a converter plant, added in 1903. Property has a good mining equipment, including an electric plant, and burns 60,000 cords of wood yearly. Production of refined copper for year ending June 30, 1903, was 1,257 tons fine copper from 46,365 tons of ore smelted. The mine has been opened extensively and shows enormous bodies of medium-grade ore, with a considerable amount of high-grade ore, and is one of the most promising of Australian copper properties.

LOCH WINNOCH MINE.

SCOTLAND.

At Loch Winnoch, Renfrewshire, Scotland. An old and long idle property, about 9 miles from Glasgow.

LOG CABIN GOLD & COPPER CO., LTD.

ONTARIO.

Office: 1103 D. S. Morgan Bldg., Buffalo, N. Y. Capitalization \$3,000,000, shares \$1 par. Lands, 700 acres on Wild Potato Lake, 12 miles east of Mine Centre, Rainy River district, Ontario, carrying gold-bearing quartz veins, on which two shallow shafts have been sunk, also 240 acres on Heron Bay, Lake Superior, Ontario, said to show indications of copper.

LOG CABIN GOLD & COPPER MINING CO.

UTAH.

Mine office: Marysvale, Piute county, Utah. Is driving a tunnel in a wide vein, said to give average assays of \$10 per ton.

LOMAGUNDA DEVELOPMENT CO., LTD.

RHODESIA.

Offices: Salisbury House, London, E. C., England. John Seear, chairman; H. Ewer Jones, consulting engineer; Geo. T. Frost, secretary; Rhodesia Exploration & Development Co., Ltd., agent in Rhodesia. Organized June 18, 1894, capitalization increased December, 1901, to £250,000, shares £1 par; issued, £228,000. Lands, 407 claims, in the Lomagunda district of Mashonaland, including the United Kingdom claim, on which development, now under way, has shown a promising body of auriferous copper ore. Company also has extensive shareholdings in the Consolidated African Copper

Trust, Ltd., Ayrshire Gold Mine & Lomagunda Railway Co., Ltd., and Rhodesian Banket Co., Ltd

LOMA VERDE COPPER CO.

ARIZONA.

Office: 316 Bradbury Bldg., Los Angeles, Cal. Mine office: Tucson, Pima Co., Arizona. Organized 1901, under laws of Arizona, with capitalization \$1,000,000. T. C. Paxton, president and general manager; P. F. Rice, secretary; L. D. Lewis, superintendent; N. E. Isbell, engineer. Lands, 16 claims, area 320 acres, 16 miles east of Tucson, near Agua Caliente Springs, at the base of the Rincon Mountain range, showing fissure veins carrying ore assaying up to 23% copper and \$5 gold per ton, developed by 3 shallow shafts and 3 short tunnels, main shaft being 300'. Has gasoline power, with small machinery plant. Company paid a small dividend in 1903, which was a proceeding of very doubtful honesty, and apparently intended solely to influence further sales of stock, as mine was closed down shortly after the dividend was paid.

LOMBARD COPPER CO.

OREGON.

Letter returned unclaimed from former office, Baker City, Ore. Organized July 19, 1902, by F. L. Evans, H. C. Pearson and W. G. Main, with capitalization \$2,000,000.

LOMBARD GOLD & COPPER MINING CO.

Letters returned unclaimed from former office, 316 McCornick Bldg., Salt Lake City, Utah.

LONDON-COLORADO PROPERTIES, LTD.

COLORADO.

Mine office: Central City, Gilpin Co., Colorado. Has bond and lease on the Pierce mine, in Central City, which gives a good showing of copper ore.

LONE PINE MINING CO.

ARIZONA.

Absorbed by Pan American Mining & Smelting Co.

LONE STAR COPPER CO.

TEXAS.

Letters returned unclaimed from former mine office, Henrietta, Clay Co., Texas.

LOOKOUT GROUP.

ALASKA.

Office: care of H. H. Wakefield, Ketchikan, Alaska. Lands, 6 claims, showing a good body of medium-grade ore, at Niblack Anchorage, Prince of Wales Island, Alaska.

COMPANIA MINERA LORETO y PROVIDENCIA.

MEXICO.

Mine office: Candamena, Chihuahua, Mexico. Owned by Jesus Poyval, Rascon Bros. and E. R. Bones. Ores carry silver, copper and lead. Has a 500' main shaft and 900' tunnel, with water power, 5-stamp mill and one-ton smelter, employing about 100 men.

LORRAINE COPPER MINING CO.

WASHINGTON.

Office: Hoquiam, Wash. Mine office: Keller, Ferry Co., Wash. Organized April 13, 1900, under laws of Washington, with capitalization \$1,500,000, shares \$1 par. Owen Jones, president; A. G. Rockwell, secretary; Fred J. Chamberlain, general manager. Lands, 22 claims, area 422 acres, also a 20-acre millsite, in two groups, the Wilmot group being in the Sans Poit

mining district of Ferry county, and the Lorraine group in the Carbon River district of Pierce county, Washington. Properties show 7 ore bodies, as fissures in granite on the Lorraine group and contact veins between porphyry and schist on the Wilmot group. Contact veins of the Wilmot group are 4' to 6' wide and give average assays of 6.5% copper, 40 oz. silver and \$4 gold per ton; fissure veins on the Lorraine group give 20% copper, 5 oz. silver and \$10 gold per ton. The Wilmot group shows malachite and azurite near surface, with chalcocite, bornite, and chalcopyrite at depth. The Lorraine group shows bornite and chalcopyrite. Developments on the Lorraine include 4 shafts, deepest 100', and 8 tunnels, 3 longest being 221', 472' and 630'. Properties have 2,016' of underground openings. Was working a small force on development at last accounts.

LOS ALAMOS MINING & MILLING CO.

MEXICO.

Office: care of Dr. Finis E. Yoakum, president, Los Angeles, Cal. Mine office: Alamos, Sonora, Mex. Said to have a very encouraging showing of auriferous copper ores.

LOST GARNET GOLD & COPPER MINING & MILLING CO.

Letter returned from former office, Everett, Wash.

LOST GULCH COPPER CO.

Letter returned unclaimed from former office, 218 S. Broadway, Los Angeles, California.

COMPAÑIA EXPLOTADORA DE LOTA Y CORONEL.

CHILE.

Office: Valparaiso, Chile. Mine office: Chañaral, Atacama, Chile. Santiago Collins, manager. Owns and operates mines in different parts of Chile. The Descubridora mine, at Carrizallo, Chanaral, was opened 1850 and is about 650' deep. The Lota mine, opened 1856, in the department of Lautaro, and the Maitenes, opened 1844, in the department of Santiago, are among the more important. The company also owns sundry coal mines. Smelter and mines are equipped with steam and electric power, and the smelter has a converter plant and refinery. Production averages about 12,000,000 lbs. of refined copper yearly, shipped to Europe as Chile bars and ingots.

LOTUS GROUP.

COLORADO.

Mine office: Russel Gulch, Gilpin Co., Colo. L. Sternberger, superintendent. Ores carry gold, silver and copper. Has steam power.

MINA DO LOUZAL.

PORTUGAL.

Office: 4, Praça dos Remolares, Lisbon, Portugal. Mine office: Louzal, Grandola, Alentejo, Portugal. Is the property of a syndicate of 6 owners. Senhor Waldemar d'Orey, general manager; Joaquin Chaves, mining captain. Lands, 1 square kilometre, showing 6 known ore bodies, largest with maximum width of 25 metres, other dimensions unknown, giving returns of 0.5% to 13% copper and 1.2 oz. silver per ton with traces of lead, zinc and gold, mainly from cupriferous iron pyrites, with occasional oxides and a little native copper. Has 4 shafts, of 12 to 30 metres depth, and a 300-metre tunnel, with about 1,000 m. of underground openings, showing about 3,000,000

tons of ore. Property, which was discovered and opened by the Romans and reopened in 1901, is idle, awaiting construction of the Lado branch railway, which should be completed in 1905.

LOW DIVIDE COPPER MINING CO.**CALIFORNIA.**

Office: care of John Murray, president, Crescent City, Cal. Lands are the Alta, Occidental and Copper Hill groups, in Del Norte county, California, on which several different veins have been opened to some extent, these showing oxide, carbonate and sulphide ores of good grade.

LOWER MAMMOTH MINING CO.**UTAH.**

Office: Salt Lake City, Utah. Mine office: Mammoth, Juab Co., Utah. Sidney Bamberger, manager. Main shaft, 1,200'. Has steam and electric power, and employs about 125 men. Ores treated in 1902 averaged 3% copper, 52 oz. silver, and 85 cents gold per ton.

GUSTAVO LOZANO.**SAN SALVADOR, C. A.**

Mine office: Chalatelango, San Salvador, Central America. Produces copper, gold and silver. Has steam power, and employs about 100 men.

LUCERO COPPER MINING CO.**NEW MEXICO.**

Letters returned unclaimed from former office, Mora, N. M.

LUCKY STRIKE COPPER MINING CO.**WYOMING.**

Office and mine: Rawlins, Carbon Co., Wyo. Organized 1904, to develop sundry claims 5 miles northwest of Rawlins.

LUCKY VERDE COPPER CO.**ARIZONA.**

Dead. Lost lands, 1904.

LUCY L. MINING & MILLING CO.**UTAH.**

Clyde H. Wilson, superintendent; Frank L. Wilson, secretary and treasurer. Property is in the Deep Creek district of Juab county, Utah, and is said to present a good surface showing of rich copper ore.

LUDWIG COPPER MINING CO.**NEVADA.**

Mine office: Yerington, Lyon Co., Nev. A. Pugh, lessee and operator. Ores carry copper, gold and silver. Has steam power and 30-ton smelter.

KUPFERBERGWERK LUDWIGSDORF.**GERMANY.**

Mine office: Ludwigsdorf, Schlesien, Germany. Employs 40 men.

LUKE CREEK GOLD-COPPER MINING CO.**BRITISH COLUMBIA.**

Offices: 435 Temple Court, Minneapolis, Minn. Mine office: Marysville, Fort Steele division, East Kootenai, B. C. Capitalization \$1,000,000, shares \$1 par. S. D. Pumpelly, president and general manager; E. D. Barcalow, secretary. Lands, 2 claims, area 110 acres.

LUSTRE MINING CO.**MEXICO.**

Office: Pittsburg, Pa. Mine office: Indé, Durango, Mex. Property is the Mina Magistral, ore of which is an argentiferous and slightly cupriferous iron pyrite, carrying 0.5% copper and about \$10 silver per ton. Company has developed a large ore body, but had not secured a satisfactory process of reduction at last accounts.

LYELL COMSTOCK CONSOLIDATED COPPER CO., LTD.**TASMANIA.**

Offices: 103, Gresham House, London, E. C. Eng. Works offices: Pilling, Macquarie Harbour, Tasmania. Organized Dec. 29, 1878, as Mt.

Lyell Comstock Copper Co., Ltd., absorbed Tasman Lyell Copper Co., Ltd., and name changed to present title, March, 1903. Capitalization, £600,000, shares £1 par; issued, £545,000. John MacArthur, chairman; J. J. Muir, mine manager; W. W. Fitcher, secretary. Lands, 300 acres, on Mt. Lyell, well located as to strike of ore bodies and showing a considerable amount of ore of low to medium grades, best grade averaging 4.5% copper. Has a tramway built to within 2 miles of the mine. Is suffering from depletion of funds and desires absorption by the Mt. Lyell Mining & Railway Co., Ltd.

LYELL PEAKS MINE.

TASMANIA.

A prospect in the Mt. Lyell district of Montague county, Tasmania.

LYELL PIONEER CONSOLIDATED.

TASMANIA.

A prospect in the Mt. Lyell district of Montague county, Tasmania.

LYELL THARSIS MINING CO. (NO LIABILITY).

TASMANIA.

Offices: Finsbury House, London, E. C., Eng., and 31, Queen St., Melbourne, Australia. W. Orr, chairman; W. H. Vale, mine manager; E. Hadden, secretary in London; J. Potts, secretary in Melbourne; Hon. N. J. Brown, agent in Tasmania; J. E. Elliott, superintendent. Capitalization, £150,000; issued, £123,000. Small dividends were paid, 1899-1901. Lands are in the Mt. Lyell district, Montague county, Tasmania. Mine was opened 1897, and largest annual product was about 1,000 tons of refined copper, from ores averaging 3.5% to 5% smelter returns. Original ore body apparently is exhausted. Mt. Lyell Mining & Railway Co., Ltd., has offered £2,000 for the company's property.

LYMNI COPPER MINING SYNDICATE, LTD.

CYPRUS.

Offices: 32, Victoria St., London, S. W., Eng. Mine office: Limassol, Cyprus. Organized March 12, 1897, with capitalization £20,000, shares £1 par; issued, £16,542. L. P. Ford, chairman; Thos. Creswell, F. I. S., secretary; Chas. Christian, mine manager. Lands, 30 square miles, in the Bellathousa district of Colis, Chrysokhow, Cyprus. Ore occurs as lenses, largest having a width of 400' and length of 1,400'. Estimated average ore values is 9% to 10% copper and 3 dwts. silver per ton, from bornite and chalcopryite. Is developed by 7 shafts of 150' to 300' depth, and a 2,100' tunnel. Ore formation apparently is continuous for 3 miles. Mine is not permanently equipped and company's estimates of values are excessive. Was employing 75 men at last accounts.

LYNGENFJORD KOBBERVAERK.

NORWAY.

Owned by Norwegian Copper Mines, Ltd.

LYNN CREEK COPPER-GOLD CO., LTD.

BRITISH COLUMBIA.

Office: 419 Hastings St., Vancouver, B. C. Mine office: Lynn Creek, Vancouver Island, B. C. Organized 1901, under laws of British Columbia, with capitalization \$300,000, shares \$5 par. G. L. Allan, president and treasurer; W. H. Pegram, secretary; W. Thos. Newman, general manager; G. Richardson, superintendent. Lands, 6 claims, area 200 acres, 8 miles from Vancouver, in the New Westminster district, showing 6 veins, of which 3 range from 5' to 40' in width, giving assays of 8.9% copper, 3 oz. silver and \$1 gold per ton. Also has a 4' to 6' vein of zinc ore, opened by 2 tunnels

giving a back of 800' to 1,000'. Mine said to have a large amount of ore in sight and can ship ore by water to smelters at Crofton, Ladysmith and Van Anda. Idle at last accounts.

LYONS KYLE GOLD MINING & MILLING CO.

COLORADO.

Mine office: Central City, Gilpin Co., Colo. Wm. Woods, superintendent. Operates the Tucker mine, carrying gold, silver, lead and copper. Has steam power, 5-stamp mill and 50-ton concentrator, employing about 25 men.

McALLISTER & CO.

NEW MEXICO.

Mine and office: Silver City, Grant Co., N. M. Lucius P. Deming, general manager. Property is the Arizona mine, developed by a 1,200' tunnel, producing auriferous and argentiferous copper ores. Has gasoline and steam power, 20-stamp mill and 40-ton concentrator. Employ about 20 men.

McCABE MINE.

ARIZONA.

Owned and operated by Model Gold Mining Co.

McCABE EXTENSION MINING & MILLING CO.

ARIZONA.

Office: Prescott, Ariz. Mine office: McCabe, Yavapai Co., Ariz. Reese M. Ling, president; E. R. McDowell, secretary; John H. Farrell, superintendent. Lands, several claims adjoining the McCabe mine of the Model Gold Mining Co., on which a 300' shaft has been sunk. Presumably idle.

McCOY GROUP.

ARIZONA.

Office and mine: care of C. E. Taylor, owner, Globe, Gila Co., Ariz.

MACKEY-BURROUGHS MINING CO.

COLORADO.

Mine office: Central City, Gilpin Co., Colo. Ores carry gold, silver and copper. Has steam power and employed 15 to 20 men at last accounts.

McKINLEY MINES, LTD.

BRITISH COLUMBIA.

Office: Grand Forks, B. C. Property is 4 claims, in Franklin camp, on the North Fork of Kettle river, about 40 miles above Grand Forks. Development is by trenching across an 80' vein of ore giving average assay values of \$8 per ton, in copper, silver and gold.

McKINLEY MINING & SMELTING CO.

NEVADA.

Lands are the Aurora group of 5 claims, at Ely, White Pine county, Nevada, formerly worked as a gold mine, but carrying copper ores in lower workings. Has a 300' main shaft and about 1,000' of drifts. Was formerly owned by Jas. A. Saxton, father-in-law of President McKinley, on strength of which the company adopted the name. Company was promoted by Hurd & Hearther, 510 Drexel Bldg., Philadelphia, senior partner of which firm is noted for promoting dubious mining propositions. Lands of company were sold at sheriff's sale, Dec. 31, 1904, and bid in by sundry shareholders, who hope to reorganize on some plan by which legitimate holders of old stock will be protected, and stock issued without adequate compensation will be eliminated.

MAADEN-KENI MINES.

TURKEY.

Mine office: Baibourt, Trebizond, Turkey in Asia. Were operated in a small way by a Greek syndicate, at last accounts.

MACKINAW MINING & MILLING CO.**WASHINGTON.**

Said to have sundry claims in Snohomish county, Washington, showing ore that gives fair assay values in copper and nickel.

MADISONIAN MINE.**MONTANA.**

Office: care of Estate of Levi Z. Leiter, owner, Chicago, Ill. Mine office: Norris, Madison Co., Mont. E. J. Trerise, superintendent. Ores carry gold, silver and copper. Has steam power, concentrator and 60-ton cyanide plant, employing about 25 men.

GRUBE MAGDALENA.**GERMANY.**

Mine office: Morsbach, Rheinprovinz, Germany. Has lead, copper and iron sulphides, worked in a very small way, with trivial production.

MAGENTA GOLD MINING CO.**COLORADO.**

Mine office: Granite, Chaffee Co., Colo. C. E. Barrie, superintendent. Has gold, silver and copper ores, and steam power. Employs about 25 men.

COMPAÑIA MINERA DEL MAGISTRAL.**MEXICO.**

Office: care of Enrique C. Creel, owner, Chihuahua, Chihuahua, Mex. Mine office: Magistral, Chihuahua, Mex. Employs about 200 men. Enrique C. Creel, owner; John Weir, manager. Lands, 35 pertenencias, area 86 acres. Has a 300' main shaft. Ores carry principally copper values. Equipment includes steam and gasoline power and a 150-ton smelter.

MAGISTRAL MINING CO.**MEXICO:**

Mine office: Ameca, Jalisco, Mex. A. Brambille, manager. Employed a small force, on development work, at last accounts.

MAGNETAWAN MINING CO.**ONTARIO.**

Office: care of R. S. Hews, secretary, Connellsville, Pa. Mine office: Burks Falls, Parry Sound district, Ontario. Presumably idle.

MAGNOLIA GOLD & COPPER CO.

Office: Seattle, Wash. Location of lands, if any, unknown.

MAGPIE GOLD & COPPER MINING CO.**WYOMING.**

Office and mine: care of S. E. Ferree, secretary, Encampment, Carbon Co., Wyo. Otto Miller, president; A. N. Prosser, treasurer. Lands, sundry claims on the South Fork of the Encampment river, near Riverside.

MAINE & MONTANA COPPER CO.**MONTANA.**

Office: Ft. Fairfield, Me. Mine office: Basin, Jefferson Co., Mont.

COMPAÑIA MINERA DE MAIPÚ.**CHILE.**

Office: Santiago de Chile. Operates El Volcan mine, opened 1884, in the department of Victoria, Chile. Ore occurs in a fissure vein, and is self-fluxing, giving average smelter returns of about 6% copper. Mine has a very intelligent management, and is securing excellent results. Costs of mining and smelting are very low, net cost of copper delivered in London averaging about £30 per long ton. Annual production is about 1,500 tons of refined copper.

JOAQUIN MAIZ y CA.**MEXICO.**

Office and mine: Villa Aldama, Nuevo Leon, Mex. C. Robles, manager. Was operating a copper property, with fair force, at last accounts.

SOCIETE ANONYME DES MINES DE CUIVRE DE MAJDANPEK. SERVIA.

Office: Brussels, Belgium Mine office: Majdašpek, Servia. Employs 500 men. Emile Thorez, chairman; Emile Fromont, administrateur délégué; Charles Brundard, secretary; Leo Zenzes, general manager; Alfred Müller, smelter superintendent; Hugo Hermann, engineer. Organized, 1903, under laws of Belgium and Servia, with capitalization 3,000,000 francs, Lands, 16,000 hectares, with trachyte and limestone country rocks, showing native copper, malachite, azurite, chalcopyrite and iron pyrites. Company estimates 600,000 tons of ore in sight, with 250,000 tons blocked out for stoping. Smelter, $\frac{1}{2}$ mile from mine, is connected therewith by a Bleichert aerial tram. Smelter has three 40-ton Herreshoff water-jacket blast furnaces and makes blister copper carrying 96% copper, 14 oz. silver and $1\frac{1}{2}$ oz. gold per ton. Company will erect a new smelter in 1905, of 200 tons daily capacity, employing the Knudsen pyritic process.

MAJESTIC COPPER MINING & SMELTING CO.**UTAH.**

Office and mine: Milford, Beaver Co., Utah. Employs about 60 men. Organized 1900, under laws of Colorado, with capitalization \$6,000,000, shares \$10 par. Has authorized a \$500,000 bond issue. Was practically reorganized, December, 1903, and went into hands of a receiver April, 1904, compromising later with creditors at 60 cents on the dollar. Harmon G. Howe, president; F. H. Bosson, secretary; Chas. A. Piddick, treasurer; Edward F. Freudenthal, superintendent. Samuel Newhouse took charge as general manager on Feb. 1, 1905, for one year, with privilege of renewing for further term if he so desires. Mr. Newhouse is an excellent financier and a competent mining man.

Lands, 120 claims, area 2,450 acres, also an 80-acre smelter site and 1,100 acres of miscellaneous lands, located in 5 districts of Beaver county, Utah, showing about 100 ore bodies in 20 or more different groups of mines and prospects. In addition to copper the ores carry gold, silver, platinum, lead, cobalt, bismuth, vanadium and uranium. Copper ores include all of the principal oxides, carbonates and sulphides, also occasional native copper and many of the rarer copper minerals, ranging from 2% to 85% in copper tenor, average value of ore being estimated by company at 12% copper, 12 oz. silver and \$3 gold per ton, with large percentages of lead, but estimates are much too high. There are 18 shafts of 100' to 400' depth, also many tunnels and innumerable test-pits. Underground development is about 30,000', and ore in sight is estimated at 1,000,000 tons, with about 500,000 tons blocked out for stoping, these figures being much overestimated also. The lands include 8 separate groups of mines, some of which were formerly worked for silver, but the silver-copper ores at and near surface gave way to copper-silver ores at depth, all ores being more or less auriferous.

The O. K. is the principal mine of the company. Selected shipments of 1,145 tons of O. K. ore gave net returns of \$95,000, a shipment of 258 tons in 1901 giving smelter returns of 40% copper, 7.5 oz. silver and \$3.80 gold per ton. The O. K. group has 7 claims, opened by a 3-compartment main shaft of 400', showing a vein ranging up to 28' width, with considerable

development on the 300' and 400' levels. Also has an undeveloped ore body, apparently about 250' wide, which is a stockwerk with veins and stringers carrying high-grade ores. The O. K. has considerable ore blocked out and a much larger amount could be blocked out by a few months of legitimate mining work.

The Old Hickory group of 9 claims, with a gossan capping about 250' wide, is opened by a short tunnel and about 50 pits and shafts, deepest 212', showing ores carrying 4% to 5% copper, with gold and silver values estimated at \$2 to \$4 per ton, from a vein 40' to 200' wide. Equipment includes a 34-h. p. Fairbanks-Morse electric hoist, Ingersoll-Sergeant air compressor and Rand drills.

The Harrington-Hickory group of 25 full and fractional claims has about 12,000' of development work, with 40 pits and shafts in ore, two deepest about 400' each, one being a 3-compartment main shaft. This group shows numerous fissure veins intersected by cross-veins, both approximately vertical, and in addition has a series of bedded veins dipping approximately 30° to 35°, giving three separate intersecting systems of ore bodies. Principal values are in lead, ores giving assays of 2% to 3% copper, 25% to 50% lead and up to 50 oz. silver and \$1 gold per ton.

The Vicksburg group of 4 claims, formerly mined for gold, shows three 2' to 20' vertical fissures, with mineralized cross-veins, opened by numerous shallow pits and shafts, with a 2-compartment working shaft.

The Hoosier Boy group of 10 claims has a 250' vertical shaft in limestone, with auriferous and argentiferous copper-lead ores. The Larkspur group of 8 claims shows a mineralized zone of 60' to 75' width, in limestone, with a granite contact, carrying irregular bunches of high-grade ore. The Copperfield group of 17 undeveloped claims lies between the O. K. and the Old Hickory mines. Miscellaneous holdings include the Apex group of 4 claims adjoining the Old Hickory, and the Ben Harrison groups.

The mine has steam, gasoline and electric power, and an undeveloped water power on Beaver river, 35 miles distant, can be made to generate about 2,000 h. p. and transmit same electrically to the mine and smelter, at an estimated cost of \$100,000.

The smelter, at Lewisville, 3 to 8 miles from the various mines, built by the Colorado Iron Works Co., has a sampling mill and a 250-ton copper furnace and one 100-ton lead furnace, with Nesmith hot-blast stoves which heat the blast to 800° Fahrenheit before entering the tuyeres. The smelter building is of steel frame, on stone foundations, and large enough to accommodate four 250-ton furnaces, with necessary machinery. The town-site of Lewisville was platted by the company. The mines and smelter are served by the Oregon Short Line railway. The company plans building a concentrator at the O. K. mine. At the close of 1904 the company was shipping about 8 carloads of high-grade ore weekly.

The Majestic is a property of exceptional merit, although its values have been grossly exaggerated, but has been very badly managed. The fiscal agents, Chapman, Mucklow & Bosson, are said to have received 40%

commission on stock sales, which was entirely too much, and Senator A. B. Lewis, the former president, is said to have interfered greatly with the raising of funds by selling from his personal holdings. The smelter was built prematurely, and while there does not seem to have been any absolute theft in connection with the company, there was considerable sharp practice. In the hands of a manager of the ability and integrity of Samuel Newhouse the Majestic should be made a success, if the necessary funds can be raised.

MALACHITE COPPER CO.**ARIZONA.**

Mine office: Williams, Coconino Co., Ariz. J. F. Durlin, secretary. At last accounts had sundry claims north of Williams.

MALACHITE COPPER-GOLD CO.**CALIFORNIA.**

Office: 209 Homer Laughlin Bldg., Los Angeles, Cal. Letter returned unclaimed from former mine office, Daggett, San Bernardino Co., Cal. Organized under laws of South Dakota, with capitalization \$1,000,000, shares \$1 par. S. A. Barrett, president; Jos. B. Cook, secretary; W. E. Steadman, superintendent. Lands, 5 claims, area 100 acres, in the Ord district of San Bernardino county, opened by a 165' shaft on a 34' vein carrying an 8' pay-streak said to assay 7.5% copper and \$3 gold per ton. Presumably idle.

MALAGON GROUP.**SPAIN.**

Mine office: Puebla de Guzman, Huelva, Spain. C. & J. Sundheim, owners; Wm. Guthrie Bowie, manager. Property is a group of government concessions showing many old workings and excellent outcrops. Owners contemplate giving the property a thorough test.

MALONEY-BLUE LEAD COPPER MINING CO.**SOUTH DAKOTA.**

Mine office: Sheridan, Pennington Co., S. D. Capitalization \$3,000,000. Is controlled, through stock ownership, by the Continental Copper Co. Ores carry gold, nickel and copper, latter in small percentages, in a vein stated to be 118' wide and opened by a 1,610' tunnel, with considerable drifting. Has steam power and has expended about \$75,000 in development.

MAMMOTH COPPER CO.

Promoted by the notorious Wm. F. Wernse gang of swindlers, 421 Olive st., St. Louis, Mo. Location of property, if any, unknown, and stock worthless.

MAMMOTH COPPER MINING CO.**CALIFORNIA.**

Office: 50, Congress St., Boston, Mass. Mine office: Kennett, Shasta Co., Cal. Is a subsidiary corporation of the United States Mining Co., and employs about 50 men. A. F. Holden, president; Wm. F. Moller, treasurer; Frederick Lyon, general superintendent; A. P. Anderson, mine superintendent. Lands, 880 acres, developed by about 2,000' of tunnels, showing a large body of medium-grade auriferous and argentiferous copper ore. Mine was purchased recently by present owners, and is being prepared for regular production. A 2-mile aerial tramway of 60 tons hourly capacity, is planned, to connect mine with a smelter, now building, which is to have five 150-ton blast furnaces. Property is regarded as of considerable promise.

MAMMOTH COPPER MINING CO.**WYOMING.**

Mine office: Saratoga, Carbon Co., Wyo. A. G. Epperson, superintendent.

MAMMOTH COPPER & SMELTING CO.**ARIZONA.**

Mine office: Red Rock, Pinal Co., Ariz. Lands, said to be 41 claims, 25 miles from Red Rock. Main shaft claimed to be 400', with about 8,000' of underground openings and a 60-ton smelter. Mill test of ore is claimed to have averaged 16% copper and 22 oz. silver per ton, and company claims to have 54,000 tons of ore blocked out for smelting. Water supply is secured from wells. The mineralized belt in which the ore bodies occur is claimed to range 300' to 600' in width, and is said to be traceable about a mile.

MAMMOTH GOLD MINING CO.**COLORADO.**

Office: 1104 Marquette Bldg., Chicago, Ill. Mine office: Central City, Gilpin Co., Colo. W. H. Paul, superintendent. Ores carry gold, silver and copper. Has steam power and worked about 10 men at last accounts.

MAMMOTH HILL GROUP.**ARIZONA.**

Mine office: Safford, Graham Co., Ariz. E. F. Buss, superintendent, at last accounts. Presumably idle.

MAMMOTH LODS MINING CO.**BRITISH COLUMBIA.**

An Oregon corporation, operating the Colorado group of claims in the Cascade Mountains, Yale & Cariboo district, British Columbia. Veins are said to run from 40' to 250' in width and to be traceable for more than two miles, and it is claimed that smelting tests have given 15% to 20% copper and \$12 gold per ton, these figures being in themselves ample evidence that they are grossly exaggerated. Such ridiculous claims carry their own refutation.

MAMMOTH MINE.**ARIZONA.**

Mine office: Dragoon, Cochise Co., Ariz. S. S. Campbell, superintendent, at last accounts. Has steam and gasoline power.

MAMMOTH MINING CO.**UTAH.**

Mine office: Mammoth, Juab Co., Utah. Samuel McIntyre, Jr., superintendent. Produces gold, silver, lead and copper, latter as a by-product. Has steam power and 60-stamp mill, employing about 150 men.

MAMMOTH TUNNEL & MINING CO.**COLORADO.**

Office: 403-331 Fourth Ave., Pittsburg, Pa. Mine office: Silverton, San Juan Co., Colo.

MANASSAS-GAP COPPER-MINE, INC.**VIRGINIA.**

Office: 25-33 Broad St., New York. Mine office: Reager, Rappahannock Co., Va. Organized Oct. 30, 1903, under laws of Virginia, as a reconstruction of the Carter Copper Co., with capitalization \$999,000, shares \$1 par. Geo. B. Wright, president; Hon. John S. Wise, vice-president; Henry P. Porter, secretary; Powhatan Weisiger, treasurer; R. R. Crook, superintendent. Lands, 700 acres, freehold, including about 400 acres of timber land, in Fauquier county, Virginia, showing a volcanic formation carrying two contact veins between Cambrian sandstone and Silurian slates, ranging 3' to 11' in width and said to give average assays of 5% copper, 10 oz. silver and \$4 gold per ton, from malachite, bornite and chalcocopyrite, associated with occasional native copper. Has about 600' of underground openings. Two railroads are within 3 and 6 miles, respectively. Company planned installing a 50-ton furnace, but was idle at last accounts.

MANCAYAN COPPER SYNDICATE, LTD.

Voluntarily wound up, August, 1902.

MANCHESTER ZINC & COPPER CO., LTD.

Voluntarily wound up April 15, 1901.

MANHATTAN GROUP.**ARIZONA.**

Letters returned unclaimed, from former mine office, Cave Creek, Maricopa Co., Ariz.

MANHATTAN COPPER MINING CO.**ARIZONA.**

Succeeded by Troy-Manhattan Copper Co.

MANHATTAN COPPER & GOLD MINING CO.**NEVADA.**

Office: 612 Dooly Blk., Salt Lake City, Utah. Mine office: Pioche, Lincoln Co., Nev. Organized July, 1902, under laws of Colorado, with capitalization \$500,000, shares \$1 par. A. B. Lewis, president; Joseph Henshaw, secretary; E. F. Freudenthal, manager. Property is slightly developed, but shows ore giving good assay values in both gold and silver.

MANHATTAN DEVELOPMENT CO.**ARIZONA.**

Office: 1 Dee Block, Houghton, Mich. Mine office: Paradise, Cochise Co., Ariz. Organized March, 1905, under laws of Arizona, with capitalization \$200,000, shares \$10 par; \$1 paid in. J. H. Rice, president; W. G. Rice, secretary and treasurer; preceding officers, Thos. F. Cole, N. M. Kaufman, S. R. Kaufman, Allen F. Rees and N. W. Haire, directors. Lands, 37 claims, area circa 600 acres, lying west and north of the Chiricahua Development Co., opened by several shallow shafts, deepest 80', and a 400' tunnel, latter showing leached ore and a little high-grade ore, with indications of permanent values at a little greater depth. Property is exceptionally well located, and management is experienced and strong.

MANICA COPPER DEVELOPMENT CO., LTD.**MOZAMBIQUE.**

Office: 123, Cannon St., London, E. C., England. M. F. Armstrong, chairman; J. S. Park, mine manager; W. E. Lane, secretary. Registered May 26, 1902, with capitalization £150,000, shares £1 par; issued, £130,000, £122,502 paid in. Lands, sundry copper claims in Manicaland, Mozambique, Southeast Africa.

MANICA COPPER EXTENSION, LTD.**MOZAMBIQUE,**

Registered, 1903, with capitalization £1,000. Moribund.

MANICA EXPLORERS, LTD.**MOZAMBIQUE.**

Offices: 615, Salisbury House, London, E. C., Eng. Registered Jan. 23, 1896, as reconstruction of Western Explorers, Ltd., with capitalization £80,000, shares £1 par; issued, £68,451. Debentures, £2,000 authorized, £1,000 issued, at 10%. Lands include 200 copper claims and 770 gold claims.

MANILA GROUP.**ARIZONA.**

Lands, sundry slightly prospected claims, about 3 miles from the Chiricahua Development Co.

MANITOU MINING & MILLING CO.**COLORADO.**

Letter returned unclaimed from former mine office, Bonanza, Saguache Co., Colo.

**MANSFELD'SCHE KUPFERSCHIEFERBAUENDE
GEWERKSCHAFT.****GERMANY.**

Mine office: Eisleben, Prussian Saxony, Germany. Organized April 10, 1876, with 69,120 shares. Dr. Ferdinand Zirkel, Dr. Dittrich and Dr. Paul Wachler, executive committee; Herman Schrader, smelter superintendent. Employs about 18,000 men in all departments.

Mine was opened A. D. 1199, and under the Counts of Mansfeld attained a high state of development and was immensely profitable during the Fourteenth and Fifteenth centuries, but the industry almost suffered extinction during the Thirty Years' war. Activity was resumed in 1671, when the right of working the mines was declared free, this resulting in the building up of a great number of small, independent operators. The present company was first formed in 1852, as a consolidation of the various small mine operators and smelters, and was reorganized under present charter in 1876. Production has increased from 1,485 metric tons in 1861, to nearly 20,000 metric tons yearly, at the present time.

The principal ore is slightly argentiferous chalcopyrite, associated with limited quantities of nickel and cobalt ores, occurring as speise, disseminated in very fine grains through the kupferschiefer, a fine-grained slate. The kupferschiefer lies nearly horizontally and ranges from 2' to 3' only in thickness, but covers nearly 200 square miles. Lying just below the kupferschiefer is an arenaceous shale carrying chalcopyrite and a limited quantity of copper carbonates. Sundry coal strata are found above the cupriferous beds, and copper ore and coal sometimes are mined and hoisted through the same shaft. Owing to the thinness of the bed and the great age and extent of the workings, it is necessary for miners to work on their sides, bellies or backs, as in coal mines, wearing boards upon their bodies and thighs in order to protect themselves from the rock floors. Owing to the great age and extent of the workings, the headings usually are 2 to 4 kilometres from the shafts, hence the actual mining is done under considerable disadvantages. The workings are of vast extent, and including old and abandoned shafts, are many in number. Among the new shafts are the Johannes, at Hohenthal, and the Hermann, at Helbra. The mines have 6 duplex Weisse & Monaki pumps, and a full equipment of hoisting engines, etc. The company maintains independent machine shops, capable of building and repairing any mining or pumping machinery in use.

The Mansfeld has numerous reduction works, including 4 smelters for raw ores, 2 roasting smelters with acid plants, 2 matte smelting works, 2 refining furnaces, and one electrolytic refinery with desilverizing plant. The various works have a total of 20 reverberatory furnaces. The principal smelters are the Krughütte, at Eisleben, with 4 furnaces; the Kochhütte, at Helbra, with 4 furnaces; the Eckhardthütte, at Leimbach, with 4 furnaces, and the Kupferkammerhütte, at Hettstedt, with 3 furnaces. All of these furnaces are of circular shaft type, with forehearth, and use cold blasts, except the Kupferkammerhütte, where hot blast is employed partially. The Saigerhütte is a refining plant, and the Gottesbelohnunghütte has 10 reverberatory furnaces.

The Krughütte, near the mine, is equipped with Steinbeck's circular multiple-hearth automatic pyritic calciners, which use no carbonaceous fuel, except for preliminary charges. The Eckhardthütte has one lead stack, producing a silver-lead matte, and making a little nickel speiss from resmelted flue-dust. The Eckhardthütte has 72 kilns and 5 lead acid chambers, and the Kupferkammerhütte has 82 kilns and 6 lead acid chambers, these works making 2,212 metric tons of 50° Beaumé sulphuric acid in 1903.

The method of reduction followed by the Mansfeld is by heap-roasting and calcining in shaft-furnaces. Roast-heaps are built about 60 metres long, 5.5 m. broad at bottom and 3 m. broad at top, and about 1.50 m. to 1.75 m. high only. The only fuel is a little brushwood at edges and bottoms of heaps, and each heap is roasted 4 to 6 weeks. If the ore as produced carries any fines, these are screened, briquetted and added to the roast-heaps. The roasting reduces the ore 8% to 20% in weight, and the roasting is more for the elimination of carbon dioxide and bituminous matter than to get rid of the sulphur, latter running only 2% to 5% in the raw ore, while the bituminous matter ranges 10% to 17%, and CO₂ is 7% to 13%. The low-grade first-fusion matte is roasted, and with the addition of 5% to 10% of raw matte, is smelted in reverberatory furnaces to white metal carrying about 75% copper and 0.40% to 0.45% silver. The slags from the white metal carry 9% to 15% copper, and are returned to the shaft-furnaces. Slag is utilized extensively, in the manufacture of slag-brick and paving blocks.

The desilverizing plant at the Saigerhütte operates on the Ziervogel method, roasting the matte and retaining the silver as a sulphate, which is dissolved in water and the solution run over metallic copper, which precipitates the silver, the cement silver so secured being pressed and resmelted to metal .999 fine. In 1903 the Mansfeld smelters treated 686,354 metric tons of ore, making therefrom 49,179 tons of low-grade matte, the average tenor of the ore being 28.19 kgs. copper and 0.156 kgs. silver per ton. Production, 1904, was 41,629,349 lbs. fine copper.

In addition to its mines and smelters the Mansfeld company has extensive industrial undertakings of a collateral and subsidiary nature, the more important of these being extensive coal mines and coke works in Westphalia, and alkali deposits and works. The company is managed with prudence and great technical skill, and the Mansfeld is an excellent object lesson of what can be made, by brains and industry, from an extensive deposit of low-grade ore.

MINA MANTO VERDE.

CHILE.

A promising property in the Sierra Amarilla district of Chile, under private ownership.

MARAVILLA COPPER CO.

ARIZONA.

Office: Providence, R. I. Mine office: Safford, Graham Co., Ariz. Wilbur H. Powers, president; Chas. B. Spaulding, superintendent. Lands, in the Gila range, about 12 miles from Solomonville, include the Lone Star mine, opened by a 500' main shaft showing a 5' vein of sulphide ore, of high grade at bottom, carrying copper, silver and gold values, latter small. Is said to have a considerable showing of 8% to 10% sulphide ore.

MARBLE BAY MINING CO.**BRITISH COLUMBIA.**

Mine office: Van Anda, Texada Island, B. C. Ores carry copper, gold and silver. Mine is opened by several shafts, deepest 360'. Has steam power and 150-ton concentrator, with ore bunkers on Sturt Bay, connected with the mine by a 2,125' tram line. Mine is said to give a good showing of argentiferous copper ore. Mine sold to the Tacoma Company.

MARGUERITA MINE.**CALIFORNIA.**

An old and idle property near Almaden, California, operated circa 1865.

MARICOPA COPPER CO.**ARIZONA.**

Letter returned unclaimed from former office, 219 North Fourth St., St. Louis, Mo.

MARICOPA COPPER MINES CO.**ARIZONA.**

Letters returned unclaimed from Wickenburg and Morristown, Maricopa county, Arizona.

MARIETTA GOLD MINING CO.**IDAHO.**

Office: care of Lawson Investment Co., 60 State St., Boston, Mass. Organized under laws of Washington, with capitalization \$1,000,000, shares \$1 par. M. E. Lawson, president and general manager; H. C. Lawson, secretary. Lands include gold claims in Ferry county, Washington, and the Atlas group of 5 claims, area 100 acres, in the Stevens Peak district of the Coeur d'Alenes, Shoshone county, Idaho. Development is by a 250' tunnel, claimed to show a 20' ore body averaging \$50 per ton in copper, gold and silver values.

MARIPOSA MINE.**ONTARIO.**

Mine office: Massey Station, Algoma, Ont. A prospect adjoining the Copper Queen of Ontario.

MARITIME COPPER & REDUCTION CO.**NEW BRUNSWICK.**

Mine office: Goose Creek, St. John county, N. B. An old property showing a large body of low grade ore. Was reopened, 1902, for a few months.

MARKEEN COPPER CO.**ARIZONA.**

Probably dead. Fully described in Vol. IV.

MARQUETTE & ARIZONA MINING CO.**ARIZONA.**

Office: Marquette, Mich. Mine office: Bisbee, Cochise Co., Ariz. Organized Dec. 6, 1902, under laws of Arizona, with capitalization \$500,000, shares \$5 par. Emil Marks, president and general manager; Jos. J. Wirtz, secretary. Lands, 37 claims, area 740 acres, adjoining the Copper Glance on the east. Has shafts of 28' and 560', also sundry pits showing iron with copper stains. Tract has a heavy conglomerate capping, much similar to that of the Copper Glance. Main shaft has 2 compartments, substantially timbered, passing through limestone showing considerable iron, and is quite wet, much of the shaft showing country rock assaying about \$2 per ton of gold. The shaft has short north and south drifts on the 400' level, and one short drift on the 145' level. Has a 35-h. p. hoist. Idle since 1903.

ANGEL MARQUEQUI.**BOLIVIA.**

Mine office: Coro Coro, La Paz, Bolivia. Works a conglomerate carrying native copper. Has steam power and employed 35 to 50 men at last accounts.

**MARSHALL & RUSSELL GOLD MINING, COLORADO.
MILLING & TUNNEL CO.**

Mine office: Marshall Park, Colo. W. C. Marshall, superintendent. Ores carry gold, silver and copper. Has water power.

MARTHA WASHINGTON MINE. UTAH.

Mine office: Silver City, Juab Co., Utah. Ores carry mainly silver values, with 2% to 3% copper.

GRUBE MARTINI. GERMANY.

Office: care of W. Von Vloten, Hoerde in W., Rheinprovinz, Germany. Has spathic iron ore and chalcopryrite, output being mainly iron, of which the production averages about 7,000 tons yearly. Has steam power and employs 60 men.

MASCOT TUNNEL CO. COLORADO.

Mine office: Turret, Chaffee Co., Colo. Elmer E. Briggs, superintendent. Ores carry gold, silver and copper.

MASHELL COPPER MINING & REDUCTION CO. WASHINGTON.

Office: 437 Banigan Bldg., Providence, R. I. Mine office: Etonville, Pierce Co., Wash. C. J. McCormick, president; J. M. Mansfield, secretary and treasurer. Limited development work has shown several small veins giving good assay values in gold and copper, especially the former. Idle.

MASON & BARRY, LTD. PORTUGAL.

Offices: 87, Cannon St., London, E. C., Eng. Mine office: Pomarao, Alemtejo, Portugal. Organized June 2, 1892, as reorganization of company of same name dating from 1878, with capitalization £210,000, shares £1 par; issued, £185,172. Has paid dividends regularly since organization, these ranging from 2s. up to 13s., dividends for 1903 being 7s. Sir Francis Tress Barry, chairman; James Francis Mason, J. P., deputy-chairman; Edward O. Barry, secretary; W. Neville, mine manager.

Property is the San Domingos mine, originally opened and extensively worked by the Romans. Has been worked by present company and its predecessors since 1858. Mine is opened for a width of about 200' and a length of about 2,000'. Product is cupriferous pyrites carrying slightly under 1% copper, with 45% to 50% sulphur, and principal values are in the sulphur rather than in the copper. After being burned for sulphur, the cinder is leached for the copper values. The copper contents are decreasing slowly but steadily. Production of ore in 1902 was 177,563 long tons and in 1903 was 217,207 tons. Production of refined copper, in 1904, was 2,949 long tons, equal to 6,605,760 lbs. fine copper.

MASS CONSOLIDATED MINING CO. MICHIGAN.

Office: 6 Beacon St., Boston, Mass. Mine office: Mass City, Ontonagon Co., Mich. Employs about 250 men. Organized 1899, under laws of Michigan, with capitalization \$2,500,000, shares \$25 par, \$18 paid in. Annual meeting, second Thursday in March. Chas. A. Lamb, president; F. W. Hunton, vice-president; Wilfred A. Bancroft, secretary and treasurer; Jas. M. Wilcox, superintendent; preceding officers, Ben. T. Cable, J. W. Davis, C. F. Lynde, W. H. Bailey, C. H. Bennett and G. A. W. Dodge, directors;

Chas. H. Krause, mill superintendent; W. A. Brown, clerk; E. V. Palmer, engineer; Thos. Hall, mining captain; Samuel V. Rawlins, master mechanic; Old Colony Trust Co., of Boston, transfer agent.

Mineral lands, 2,400 acres, are in a very irregular but fairly compact tract in Sections 33, 34 and 35, T. 51 N., R. 38 W., and in Section 1, T. 50 N., R. 39 W., bounded on the north by the Union, Adventure and farm lands; on the east by the Adventure, Toltec and Evergreen; on the south by the Flint Steel and the Knowlton mine of the Adventure and on the west by the Flint Steel, Adventure and St. Mary's Mineral Land Co. Lands include three old mines, the Ridge, Mass and Ogima, also two old prospects, the Merrimac and Hazard, joint production of which, under previous managements, was 5,565 tons, 1,023 lbs. refined copper. The Ridge mine, operated 1850-1874, made 2,567 tons, 449 lbs. of copper and paid dividends of \$100,000. The old Mass mine, opened 1856 and worked intermittently until 1886, secured a total output of 2,507 tons, 266 lbs. of copper, and the Ogima, opened 1860 and closed 1868, made 491 tons, 308 lbs. of copper. The Merrimac and Hazard were early-day explorations, without production. These five properties are described in detail in Vol. II.

The Mass tract carries six of the seven cupriferous amygdaloids of the Evergreen belt, these averaging about 10' width, but varying greatly from point to point, with a sharp bend in their strike, this varying from N. 32° E., on the north, to N. 37° E. at the south. The dip of the lodes varies from 38° at the Ridge to 47° at the old Mass mine. The lodes of the Mass Consolidated are as follows, from north to south:

- (1) Knowlton. Carries heavy copper and stamp rock.
- (2) Mass. Lies 140' south of the Knowlton. Carries a little heavy copper and stamp rock.
- (3) North Butler. Lies about 75' south of the Mass bed. Is wide and fairly mineralized in places.
- (4) Butler. Lies about 200' south of the North Butler. Is 12' to 35' wide and very bunchy, carrying mainly stamp copper, with some mass.
- (5) Ogima. Lies about 100' south of the Butler. Is mainly a stamp lode, with some barrel-work and occasional masses. Runs 10' to 25' wide and shows but little good ground.
- (6) Evergreen, or Ridge. Lies about 250' south of the Ogima. Is the best lode of the property, running 4' to 40' wide, and usually being richest where of good width. Is very bunchy but shows some excellent stopes yielding heavy copper and stamp rock.

The Mass has openings on all of its copper-bearing beds and rock is hoisted through the nearest shaft, communication between lodes being afforded by crosscuts on various levels. The Mass has the outcrop of the lodes of the Evergreen belt for about $1\frac{1}{2}$ miles, giving a total of $7\frac{1}{2}$ miles for all six beds.

"A" shaft, formerly known as the Ridge, 1,378' deep, with 3 compartments, is down to the 14th level on the Evergreen lode, and is connected with the Butler lode by crosscuts on the 6th, 7th and 8th levels. The Ever-

green lode runs narrower here than in "B" shaft, averaging only 8' to 10' width, but shows much rock of excellent grade. The shafthouse is of wood, with corrugated iron sheathing, and rock hoisted goes by gravity-tram over an 875' trestle to the rockhouse at "B". "B" shaft, 875' southwest of "A", is old No. 3 Ridge shaft, cut down to 2-compartment size, and is bottomed on the 15th level, at a depth of 1,391'. The levels are of varying depths, owing to the old workings having 60' levels, while some of the newer levels at the bottom are 135' apart. Deep levels permit considerable saving in worthless drifts through poor ground, while sub-drifts can be run wherever needed. "B" shaft is on the Evergreen lode, upon which the major portion of the openings have been secured, but the Butler has been reached by crosscuts on numerous levels, and shows some good stopes. The Knowlton bed has been opened also by a crosscut on the 7th level, and shows good stamp-rock and considerable heavy copper. The main reliance, however, is upon the Evergreen, which is a strong amygdaloid, with plainly defined walls and a dip of 43°, showing some good stopes, of width up to 20' and even 25'. The Evergreen, while exceedingly bunchy, and carrying heart-breaking stretches of almost barren ground, shows beautiful stopes occasionally, and the average copper contents per fathom of ground broken probably exceed the average of all but the best amygdaloids worked in Houghton county. The shaft-rockhouse at "B" is of wood, iron-sheathed, 48x65' and 80' high, equipped with steam-hammer, two 22x28" Blake crushers and a 12x24" Nordberg engine.

"C" shaft is the old Ogima shaft, cut down to 3-compartment size, re-timbered and deepened to 454'. It is 2,148' southwest of "B", and is sunk on the Butler lode, which makes a very fair showing at this point, and has opened the Knowlton bed by a crosscut. "C" shaft was shipping about 50 tons of rock daily, by sleighs, with an all down-grade haul, but will be given rail connections in the spring of 1905. Surface equipment is of a temporary nature throughout.

"D" shaft is a mere pit, about 800' southwest of "C".

There are a number of old shafts, the 450' main shaft of the old Mass mine proper having 7 levels opened on the Knowlton lode. This was pumped out in 1901 and the showing pronounced satisfactory. The Ogima lode has been opened at several points by crosscuts from "A" and "B" shafts and was found bunchy, though showing good stopes. The mine, as a whole, is notably rich in mass copper and carries considerable silver values, the ground ranging from very rich to absolutely barren. All rock selection is made underground and culls used for filling.

"A" and "B" shafts are operated from a 44x150' central engine-house of wood, iron-sheathed. The hoist is a 24x48" Allis-Chalmers duplex, with 10' drums having 11' faces, grooved for 1½" cable and good for one half-mile depth, operating two six-ton skips in counterbalance, one in each shaft. The engine-house also covers boilers, compressors and electric machinery. There are two 250-h. p. Stirling water-tube boilers, a 50-drill two-stage

cross-compound Rand air compressor and a 75-kilowatt dynamo that furnishes electric lights for the various mine buildings.

In addition to the usual mine buildings there are about 50 dwellings, some new, but mostly old buildings thoroughly remodeled. The company also has a townsite, Mass City, which is the terminus of the Mineral Range railroad and a station on the C. M. & St. P. railway. This town has a number of business houses, a bank, newspaper, hotels, etc., and is much more than an ordinary mining location, the realty holdings therein of the Mass company being of considerable value.

The Mass mill is at Keweenaw Bay, on an arm of Lake Superior, at the junction on the Mineral Range and Duluth, South Shore & Atlantic railways, 16 miles south of Houghton and 34 miles northeast of the mine, with ample sand-room, deep water and immunity from heavy seas. The mill is 90x210', of steel on stone foundations, built by the Wisconsin Bridge & Iron Co., with two Nordberg stamps having vertical mortar-grates supplied with automatic hydraulic cleaning devices, and has jigs and four Wilfley tables. Each head has a nominal stamping capacity of about 525 tons daily, with actual daily average duty of 480 to 500 tons. It is planned to remodel both heads into steeple-compound stamps, with nominal duty of 700 to 750 tons each. A Parnall-Krause atmospheric stamp of small size reduces oversize material from the stamp mortars. The Mass uses one stamp, and the other is leased to the Michigan mine. The Mass mineral averages about 75% copper.

The 30x60' boiler house, of wood, with iron sheathing and truss roof, has two 225-h. p. Stirling boilers. Ashes and cinders are washed into the lake through a launder. The 40x70' pumphouse, with a 16,000,000-gallon Nordberg vertical pump, has a 12x30' well, with bottom 6' 6" below mean water level, connected with a tunnel running 300' under the bed of the bay to the intake. A 1,000' wharf, also serving as a breakwater, has 18' of clear water at its end, with three towers and derricks to unload coal vessels at the rate of 900 tons daily. Coal is taken from the wharf in 3-ton cars by a 14x20' hoist, to a 1,500' trestle of 20,000 tons storage capacity. There also is a 30x40' warehouse, with office in front, a smithy, machine shop and about a dozen dwellings on a townsite platted by the company, this also having several business buildings and a number of dwellings.

Production of fine copper was 2,345,805 lbs. in 1902, 2,576,447 lbs. in 1903 and 2,182,931 lbs. in 1904. Returns from the stamp-rock are small, probably averaging 12 to 15 lbs. only per ton, but 40% to 45% of the mine's total product is heavy copper that does not go through the mill.

The Mass started production with inadequate openings. On paper the total feet of openings, looked large, but deducting therefrom the unproductive shafts and about a mile of crosscuts, the total available openings were entirely inadequate, for a mine so bunchy as the Mass. That the mine has been able to maintain a considerable and fairly steady production, with so little ground opened ahead of actual stoping, speaks well, both for the mine and its management. The operations of 1904 showed a small net profit, but realizing that

what the mine imperatively required to reach success was greater openings, the management courageously levied a \$2 assessment, payable \$1 Dec. 1, 1904, and \$1 June 1, 1905. The \$200,000 secured from this assessment will be expended almost exclusively underground, the only pressing surface requirements being for the equipment of "C" shaft and the compounding of both heads at the mill, the latter work calling for about \$20,000. At the close of 1904 the monthly drifting averaged about 450' and 35 drills were running. Forces will be largely increased and in about 18 months the Mass should have sufficient openings to give the mine what it never has had before—which is, an opportunity to feed two stamps with selected rock, and to secure the advantages consequent upon a greater choice of stoping ground, and the economies resulting from increased production.

MASSEY STATION MINING CO.

ONTARIO.

Office: 7 Wall St., New York. Mine office: Massey Station, Algoma, Ont. Organized 1900, under laws of Ontario, with capitalization \$1,000,000, shares \$100 par. John J. Thompson, president; Robt. McKay, secretary; Jos. Errington, general manager; R. C. Barclay, clerk and purchasing agent; James Summers, mining captain. Company is closely connected with the Orford Copper Co., which is controlled by the International Nickel Co. Lands, 640 acres, also 160 acres miscellaneous lands, in Salter Twp., Algoma district, Ontario, showing 5 ore lenses, of which 2 are being developed, these having an average width of 10', one being opened to length of 358' and depth of 370', giving assays of 5% copper, with traces of gold and silver. Main shaft is 370', with 4 levels, opened 80' apart, and considerable drifting on each level. Estimated amount of ore blocked out for stoping is 50,000 tons. The ore is a finely disseminated, silicious chalcopyrite, not adapted to wet concentration, owing to excessive sliming, hence a 50-ton experimental oil concentrator using the Elmore process has been installed, and is understood to be giving good results. Production is said to be about 100 tons of ore daily, and concentrates are shipped for smelting to the Copper Cliff smelter of the Canadian Copper Co., the silicious ores of the Massey being excellently adapted to fluxing the copper-nickel ores of the Sudbury district. Has a steam plant with 6-drill Ingersoll-Sergeant air-compressor and 6½x8" and 10x12" Lidgerwood hoists.

MASTODON GOLD & COPPER CO.

Letter returned unclaimed from former office, Spokane, Wash.

GEWERKSCHAFT KUPFERBERGWERK MAXIMILIAN.

GERMANY.

Mine office: Nieder-Ludwigsdorf, Schlesien, Germany. Has 2 shafts, the Amalia of 75 metres and the August of 25 metres, employing 40 men. Production is about 175,000 lbs. fine copper yearly.

MAY DAY MINING CO.

UTAH.

Mine office: Eureka, Juab Co., Utah. J. A. Hunt, superintendent. Is a gold and silver mine, making a little copper as a by-product. Has steam plant and concentrator, and employs 40 to 50 men.

MAYFLOWER MINING CO.

MICHIGAN.

Office: 60 State St., Boston, Mass. Mine office: Calumet, Houghton

Co., Mich. Organized 1899, under laws of Michigan, with capitalization \$2,500,000, shares \$25 par, \$8 paid in. Annual meeting, third Wednesday in March. H. F. Fay, president; Geo. G. Endicott, secretary and treasurer; Jas. Chynoweth, superintendent; preceding officers, John C. Watson, Manning Emery and Stephen R. Dow, directors.

Lands, 840 acres, in Sections 7 and 8, T. 56 N., R. 32 W., also a millsite on Torch Lake. The Kearsarge mine lies to the north, Old Colony to the south and the South Kearsarge and Wolverine mines to the west. Exploratory work has begun in 1899 and still continues. No. 1, or Faull shaft, is 400' deep, with considerable drifting on the first and second levels and has a crosscut opening two parallel cupriferous amygdaloids. This shaft shows occasional patches of copper, but nothing of much promise. No. 2, or Isle Royale shaft, 160' deep, has several hundred feet of drifting and shows a buncy amygdaloid, 10' to 12' wide, carrying more or less copper in a 2' streak next the hanging wall. No. 3, or Sandstone shaft, is 60' deep, in a soft and badly broken amygdaloid, all of the strata near the Eastern sandstone being much disturbed. No. 4 shaft, 580' deep, starts from surface on an unnamed amygdaloid lying approximately 2,000' east of the Kearsarge bed, and at a depth of 425' runs into a parallel amygdaloid lying 90' to the eastward of the first bed, this flying switch being caused by the angle of dip of the strata flattening at little depth. The north drift from the bottom of this shaft shows occasional patches of good stamp-rock, but so far they are too limited and too far apart to give much promise of profit. At a distance of 539' west of this shaft the westerly crosscut intercepted a 14' amygdaloid carrying a little stamp-copper, and this lode will be drifted upon until its value is determined. A fairly complete geological cross-section has been obtained by drill-borings, and this is being supplemented by careful and systematic underground work. Surface improvements include a hoist good for 600', boilers and air compressor, with necessary buildings.

MAZAPIL COPPER CO., LTD.

MEXICO.

Offices: 47, Peter St., Manchester, Eng. Mexican general office: Apartado 17, Saltillo, Coahuila, Mexico. Mine office: Mazapil, Zacatecas, Mex. Re-organized April 21, 1896, with capitalization £300,000, shares £10 par; issued, £240,000. Wm. Purcell, managing director; Walter J. Browning, superintendent; T. S. Abbott, engineer. Lands include the San Eljio, Salaberna and other mines, having auriferous and argentiferous copper ores, with 83 different shafts and mines. District is arid and operations frequently are hampered by shortage of water. Company plans building an aerial tram to connect the mine with a railroad near San Pedro Ocampo, and to install new machinery. Production is considerable, reaching to perhaps 7,000 tons of auriferous and argentiferous copper and lead ores monthly, and output of refined copper for 1903 was 6,108,123 lbs. The company has smelters at Concepcion del Oro and Saltillo, the former small and out-of-date. The Saltillo smelter, of 500 tons daily capacity, was begun 1904, and should be completed early in 1905. The company has a vigorous management and is developing important mines.

MAZE MINE.**JAPAN.**

Mine office: Nishi-Kambara-gori, Echigo, Japan. Opened 1688. Production has decreased latterly. Has several small veins, averaging 1' in width, carrying chalcopryrite and iron pyrites, frequently associated with sphalerite and galena, lying mainly in propylite. The ore yields 17% to 20% copper after careful selection. Production for 1900 was 110,582 lbs., refined copper.

MEADOW MINING CO.**MICHIGAN.**

Office: 50 State St., Boston, Mass. Mine office: Copper Falls, Keweenaw Co., Mich. Organized 1898, under Michigan laws, with capitalization \$1,500,000, shares \$25 par. W. F. Fitzgerald, president; John Brooks, secretary and treasurer; Wesley Clark, agent. Lands, 364 acres, adjoining the Humboldt and Phoenix mines. Has been slightly prospected, but never was a producer. Fully described in Vol. I.

MECHAN HERMANOS.**MEXICO.**

Mine office: Viesca, Coahuila, Mex. Operates the Santa Maria copper mine, opened by shafts and tunnels, and employ about 100 men.

MEDICINE BOW'S MINES CO.**WYOMING.**

Office: Laramie, Wyo. Mine office: Holmes, Albany Co., Wyo. Organized Sept. 19, 1903, under laws of Wyoming, with capitalization \$100,000, shares \$10 par. Wm. Benton, president and general manager; S. C. Downey, secretary; J. Wells, treasurer; G. S. Simmons, superintendent; H. H. Houston, engineer. Lands, 8 claims, area 165 acres, also 10-acre millsite, showing country rocks of syenite, hornblende, diorite and schists, carrying 4 veins, occurring as fissures in diorite and as contacts between schist and igneous rocks. Two veins, said to average 25' width, are being developed, these showing oxidized ores above and chalcopryrite below, giving assays of 5% copper, from a trace to 4% lead, from a trace to 10% zinc, 5 oz. to 8 oz. silver and \$2 to \$15 gold per ton, opened by four shafts, deepest 55', and a number of tunnels, longest 885', with 1,455' of underground openings. Company plans erecting a concentrator at mouth of tunnel and continuing development work during 1905.

MEGORRIS COPPER CO.**ARIZONA.**

Mervin Rice, president; W. H. Coe, secretary. Capitalization \$600,000. Lands, sundry copper claims in the Old Hat district of Pima county, Arizona, said to show good ore, but located 40 miles from nearest railroad. Idle for several years.

MEGUNTICOOK GOLD & COPPER MINING CO.**COLORADO.**

Office and mine: Lake City, Hinsdale Co., Colo. P. G. Dawson, local director. Mine idle and company's finances badly muddled.

GRUBE MEHLBACH.**GERMANY.**

Mine office: Weilmünster, Hessen-Nassau, Germany. Ores carry lead, silver, gold, copper and zinc. Has steam and electric power.

MELBA MINING CO.**ARIZONA.**

Mine office: Patagonia, Santa Cruz Co., Arizona. R. L. Hamill, superintendent. Property is the Alta mine, carrying ores of silver, lead and copper. Has steam power and employed about 12 men at last accounts.

MELCZER MINING CO.**MEXICO.**

Succeeded by Copete Mining Co., but is said to retain direct title to properties of latter.

MELKEDALEN, LTD.**NORWAY.**

Offices: 23, Leadenhall St., London, E. C., Eng. Registered Apr. 26, 1904, as reconstruction of Melkedalen Copper Mines, Ltd., with capitalization £125,000, shares 10s. par; issued, £58,543. G. B. Mee, chairman; W. A. Stearns, secretary. Lands, 440 acres, in the Røros district, at Evenaes, Ofoten Fjord, Norway, equipped with a 150-ton concentrator.

MELKEDALEN COPPER MINES, LTD.**NORWAY.**

Reorganized, 1904, as Melkedalen, Ltd.,

MELROSE COPPER MINE.**AUSTRALIA.**

Office: care of H. E. A. Miller, manager, Stock Exchange, Pitt St., Sydney, N. S. W., Australia. Mine office: Condobolin, Cunningham Co., N. S. W., Australia. Was known previously as the Anaconda, and earlier as the Boone West mine. Malcolm Darrach, superintendent. Mine shows 3 veins, No. 1 carrying 3' of chalcocite and about 3' of mixed ore; No. 2 vein, 6' in width, carries cuprite and chalcocite, while No. 3 vein, also of about 6' width, carries both lead and copper ores. Mine is opened by 2 shafts, of 90' and 100' depth, with about 600 tons of high-grade ore ready for breaking.

MEMPHREMAGOG MINING CO.**QUEBEC.**

Mine office: Bolton Centre, Brome Co., Quebec. Property is the old Smith mine. Idle.

MENDOCINO COPPER KING MINING CO.**CALIFORNIA.**

Mine office: Yorkville, Mendocino Co., Cal. Presumably idle.

MENDOTA MINE.**MICHIGAN.**

An extensive tract of mineral land in the northeastern part of Keweenaw county, Michigan, on which considerable work has been done from time to time, but idle for many years past. Fully described in Vol. II.

MENDOTA MINE.**NEVADA.**

Mine office: Bullion, Elko Co., Nev. J. T. Donnellan, superintendent, at last accounts. Ores carry silver, copper and lead.

MENDOZA y CA.**MEXICO.**

Mine office: Barranca del Cobre, Chihuahua, Mex. Produced 195 metric tons of copper in 1902.

MENLO PARK COPPER MINING CO., LTD.**NEW JERSEY.**

Mine office: Menlo Park, Middlesex Co., New Jersey.

SOCIEDAD ANOMINA COBRES DE MENORCA.**SPAIN.**

Offices: Gran Via, 32, Bilbao, Spain. Employs about 75 men. Organized October, 1901, under laws of Spain, with capitalization 2,000,000 pesetas, shares 250 pesetas par, 35% paid in. Cirilo de Gana, president; Fernando Olascoaga, vice-president; Manuel de Ozamir, secretary; Esteban Puego, managing director; Baron de Prisbuer, purchasing agent; Don Santiago de Arechago, consulting engineer. Lands, 411 hectares, about 1,000 acres, including the Rubia, Partida, Emilia and other copper mines, at the base of Mt. Toro, near Mercadal, district of Mahon, Island of Minorca, Spain. Property is undergoing development.

MERAKER MINES.

Owned by Vignes Kobbervaerks Aktiebolag.

NORWAY.

MERISSKI WORKS.

Office: care of R. A. Richner, Batum, Russia. Mines are in the government of Kutais, Tiflis, Russia. Production in 1899 was 164,092 lbs. fine copper.

RUSSIA.

W. & J. MERRY MINING CO.

CHILE.

Mine office: La Serena, Coquimbo, Chile. Santiago Merry, general manager. Has steam power and smelter, employing upwards of 100 men.

MESA MINING & REDUCTION CO.

ARIZONA.

Office and mine: Mesa, Maricopa Co., Ariz. Organized 1904, with capitalization \$2,000,000.

MESCAL MINING & MILLING CO.

ARIZONA.

Letter returned unclaimed from former mine office, Providence, Yavapai Co., Ariz.

MESCALERO MINING & MILLING CO.

NEW MEXICO.

Mine office: Roswell, Chaves Co., N. M. J. A. Ryan, president; J. A. Cottingham, secretary; John S. Lenox, manager; James E. Hunt, superintendent; John Kinnie, mill superintendent. Mine is developed by a 400' tunnel and is a producer of gold, silver and copper. Has steam and electric power, 20-stamp mill, concentrator, 100-ton cyanide plant and 50-ton smelter, and plans adding a 500-ton cyanide plant and a 200-ton smelter.

COMPANIA METALURGICA.

MEXICO.

Mine office: Matehuala, San Luis Potosi, Mex. H. N. Nichols, president. Company is said to plan building a large smelting plant, to have 2 lead furnaces and 3 copper matting furnaces.

COMPANIA METALURGICA MEXICANA.

MEXICO.

Office: 82 Beaver St., New York. Mine offices: Sierra Mojada, Coahuila, Mex., and Concepcion del Oro, Zacatecas, Mex. Works office: San Luis Potosi, S. L. P., Mex. Robt. S. Towne, president and treasurer; Geo. Foster Peabody, first vice-president; A. Foster Higgins, second vice-president; Chas. J. Nourse, Jr., secretary and assistant treasurer; D. C. Brown, general manager; Geo. H. Carnahan, superintendent; C. M. Van Cleve, smelter superintendent; Frank W. Carnahan, engineer; James Ganett, mine superintendent at Sierra Mojada; Ludwig Heldt, mine superintendent at Concepcion del Oro; Morton Trust Co., registrar. Annual meeting, first Monday in June. Employs about 1,500 men.

Organized 1890, under laws of New Jersey, with capitalization \$4,000,000, shares \$100 par, in \$1,000,000 cumulative 8% preferred, \$1,250,000 guaranteed 6% second preferred, and \$1,750,000 common stock. Bonds, \$2,000,000, at 5%; sinking fund, 2% per annum of outstanding bond issue.

Property interests are extensive, including control of the Sombbrero Mining Co., Alvarez Land & Timber Co., Mexican Lead Co., Montezuma Lead Co., Potosi & Rio Verde Railway Co., Mexican Mineral Railway Co. and sundry other subsidiary mining, land and transportation companies.

Among properties owned outright are the Veta Rica mine, at Sierra Mojada, producing cupriferous silver-lead ores, opened by a 600' main shaft, ores averaging 3 % copper, 5% zinc and 20 oz. silver per ton. At Concepcion del Oro the Cerro Prieto and adjoining mines, opened by tunnels, produce auriferous copper ores, employing about 100 men. The smelting plant, at San Luis Potosi, is of 1,000 tons daily capacity, with modern equipment throughout, including roasting furnaces, blast furnaces for lead and copper ores, briquetting plant, etc., with steam and electric power, employing about 1,000 men.

METHOW GOLD & COPPER MINING CO.

WASHINGTON.

Office: 77 Jamieson Blk., Spokane, Wash. Mine office: Winthrop, Okanogan Co., Wash. W. D. Scott, president; J. N. Tewinkel, secretary and treasurer. Organized under laws of Washington, with capitalization \$90,000, shares 5 cents par. Lands, 8 claims, area 150 acres, showing fissure veins in metamorphosed conglomerates of Huronian age, carrying sulphide ores assaying 9% copper, 2 oz. silver and \$5.50 gold per ton, developed by a 52' shaft and three tunnels, longest 465'. Has available water power and timber:

METROPOLITAN MINING CO.

WASHINGTON.

Mine office: Berlin, King Co., Wash. H. J. McIntosh, superintendent, at last accounts. Ores carry gold, silver and copper. Has water power.

MEXICAN-ARIZONA MINING CO.

ARIZONA.

Absorbed, 1903, by New England & Clifton Copper Mines of Arizona.

MEXICAN CONSOLIDATED MINING & SMELTING CO.

MEXICO.

Office: 60 State St., Boston, Mass. Organized 1904, under laws of Maine, with capitalization \$2,000,000, shares \$10 par. W. S. McCornick, president; Larkin T. Trull, vice-president; Stephen M. Crosby, treasurer; Wm. J. Freeman, secretary; Edward L. White, managing director; Duncan McVichie, consulting engineer; Frank C. Morehouse, mine manager. Properties, located in the San Pedro district of Chihuahua, show considerable bodies of ore, carrying good values in silver, copper and gold, former predominating. It is expected that these ores can be concentrated about 8 into 1, with a good modern plant. Officers of company are closely identified with the Bingham Consolidated Mining & Smelting Co., and are experienced and capable mining men.

MEXICAN COPPER CO.

ARIZONA.

Mine office: Martinez, Yavapai Co., Arizona. E. S. Yankee, superintendent, at last accounts. Ores carry copper, silver and gold.

MEXICAN COPPER CO.

MEXICO.

Mine office: Salinas, San Luis Potosi, Mex. R. B. Watson, manager, at last accounts. Has steam and gasoline power and a small smelter.

MEXICAN COPPER SYNDICATE, LTD.

Offices: St. George's House, Eastcheap, London, E. C., England. J. Peters, chairman; G. Mountier, secretary. Capitalization, £15,000; issued, £1,700. Location of property, if any, not learned.

MEXICAN INVESTMENT & DEVELOPMENT CO.**MEXICO.**

Letter returned unclaimed from former office, Philadelphia, Pa. Mine office: Ejutla, Jalisco, Mex. Said to own the Agua Blanca mine, opened by Americans in 1850. Ore occurs as chalcopryite and bornite, running 4% to 5% copper. A 50-ton concentrator was planned at last accounts.

MINA MEXICO.**MEXICO.**

Mine office: Sabinal, Chihuahua, Mex. Uriatta Hermanos, owners. Ores carry silver, copper and lead. Has steam power and employs a small force.

MEXICAN MINERALS CO., LTD.**MEXICO.**

Offices: 28, Budge Row, London, E. C., Eng. Letter returned unclaimed from former mine office, Zimapam, Hidalgo, Mexico. S. Crowder, managing director; Hedley D. Crowder, mine manager, at last accounts. Capitalization, £36,000; issued, £31,507; debentures, £10,000. Lands, 300 pertenencias, area about 750 acres, including the Moctezuma mine, carrying ores of copper, gold and silver. Mine is developed open-cast and has water and electric power.

MEXICAN UNION MINING CO.**MEXICO.**

Office: 753 Monadnock Bldg., Chicago, Ill. Mine office: Union de Tula, Jalisco, Mex. Organized April, 1902, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Newton B. Storer, president; Chas. G. Thompson, secretary; Wm. H. Lees, general manager; B. W. Sweet, mill superintendent and engineer. Lands, 100 pertenencias, area 247 acres, in the Ayutla district, showing a 30' fissure vein, with laterals, in limestone, opened by a 275' shaft showing chalcopryite giving assays of 7% copper, 10 oz. to 50 oz. silver and from a trace to \$10 gold per ton. Has a 75-h. p. steam plant and has contracted for the development of a water power. A 35-ton concentrator has a 7x9" Dodge crusher, 1 train of rolls, one 5' Huntington mill and 3 Overstrom tables. Employed 40 men at last accounts.

MEXICOLA GOLD-COPPER MINING CO.**COLORADO.**

Office: Cripple Creek, Colo. M. J. Maynard, president; T. J. Hines, secretary. Organized under laws of South Dakota, with capitalization \$200,000. Lands, 3 gold claims north of Rhyolite Mountain, and 9 copper claims, area 78 acres, in the Little Badger district, near Howard, Colo.

MICHIGAN & ARIZONA DEVELOPMENT CO.**ARIZONA.**

Office: care of Little & Prindle, Guaranty Loan Bldg., Minneapolis, Minn. Organized 1903, under laws of Arizona, with capitalization \$200,000, shares \$2 par, 50c. paid in. C. C. Prindle, president; C. W. Sexton, vice-president and secretary; Wm. A. Paine, treasurer; Fred. B. Close, general manager. Company holds an option on 100,000 shares of the capital stock of the Helvetia Copper Co., and is reopening that company's mine, planning to deepen the 400' Isle Royale shaft to 800' or 1,000'. Operations will be confined exclusively to development work, and if the showing secured is satisfactory, the Michigan & Arizona Development Co. will exercise its option and acquire 100,000 shares of Helvetia stock, leaving the Helvetia with 42,500 shares of treasury stock for further development and operating expenses. Employed about 25 men at last accounts.

MICHIGAN-ARIZONA MINING CO.**ARIZONA.**

Succeeded, 1904, by Mt. Union Consolidated Mining Co.

MICHIGAN & ARIZONA MINING CO.**ARIZONA.**

Office: care of James E. Whalen, vice-president, Sault Ste. Marie, Mich.

MICHIGAN BOY MINING & MILLING CO.**WYOMING.**

Office: care of Dr. C. W. Long, superintendent, Denver, Colo. Lands are supposed to be in the Encampment district of Wyoming.

MICHIGAN COPPER MINING CO.**MICHIGAN.**

Office: 15 William St., New York. Mine office: Rockland, Ontonagon Co., Mich. Employs 280 men. Organized Jan. 5, 1899, under laws of Michigan, with capitalization \$2,500,000, in 100,000 shares, \$25 par, \$17 paid in. Last assessment, \$1 per share, was levied December, 1903. Annual meeting, first Tuesday in May. John Stanton, president; Jos. E. Gay, vice-president; J. Wheeler Hardley, secretary; John R. Stanton, treasurer; preceding officers and Alfred M. Low, directors; Samuel Brady, superintendent; S. Howard Brady, assistant superintendent; J. C. Thomas, mining captain; A. H. Sawyer, engineer; Henry Stubensky, clerk; S. S. Jennison, master mechanic. American Loan & Trust Co., of Boston, transfer agent. Old Colony Trust Co., of Boston, registrar.

Official returns to the state of Michigan, as of date Jan. 1, 1904, disclose the following figures:

Amount cash paid in on capital stock.....	\$1,500,576.00
Amount paid in by conveyance of property.....	670,350.00
Entire amount invested in real estate.....	734,550.46
Amount of personal estate.....	103,310.20
Amount of unsecured or floating debt.....	59,364.56

Lands, 4,870 acres of mineral territory, 1,264 acres of timber lands and a 150-acre millsite, giving a total of 6,288 acres, mineral lands being in Sections 1, 2, 3, 9, 10, 11, 13, 14, 15, 16, 17, 21, 22, 23, 24, 25, 26 and 27, Town 50 North, Range 30 West. The main tract is 3 miles east and west by $4\frac{1}{2}$ miles north and south, in addition to which there are four scattering tracts to the westward, one of 40, two of 80 and one of 160 acres, carrying the outcrop of the Calico amygdaloid. The Michigan tract includes the old Minnesota, Rockland and Superior mines. The Superior made 283 tons, 1,331 lbs. of refined copper, 1856-1869 and 1876-79. The Rockland, lying next east of the Minnesota, was operated 1853-1870 and made 3,105 tons, 309 lbs. of refined copper, from the Minnesota contact vein, which averaged about 2' width and carried considerable silver. The old Minnesota mine, opened circa 1847, closed 1870, made 17,352 tons, 668 lbs. of copper and paid dividends of \$1,820,000.

The Minnesota or Minesota, as it was then spelled, was discovered by a line of prehistoric pits, in one of which was a 6-ton mass of copper, raised of skids, on top of which grew a hemlock tree having nearly 400 rings of annual growth. Immense masses of virgin copper were taken from the Minnesota, the largest, found in 1856, measuring 12'6"x18'6"x46', weighing 527 short tons and requiring the work of 20 men for 15 months in cutting

it into pieces small enough for hoisting. The Minnesota was opened on a contact vein having a gangue of quartz, epidote and calcite, with an amygdaloid hanging and conglomerate footwall, both of which were impregnated with copper near the contact. Miners called the Minnesota a conglomerate mine, because more copper was found in the footwall than in the denser amygdaloid hanging wall. The richest ground occurred near the "counter vein," a transverse fissure. The Minnesota had a 40-ton mill with gravity stamps, but its production was mainly from masses and the smaller pieces of native metal called barrel-work. The old Minnesota company met low prices for copper, a pinching of the vein and the necessity for more powerful hoists, simultaneously, in 1870, and gave up the struggle. The openings above the adit level, being free from water, were worked by tributors for years afterwards, and yielded hundreds of tons of mass and barrel copper, thus affording ample evidence that an immense amount of heavy copper must remain in the lower stopes, then inaccessible to tributors because filled with water. The old stopes below the water level also should yield considerable stamp rock, left unmined in the days when nothing under 3% rock would pay for milling.

The Minnesota had 10 shafts, the deepest being down about 1,100'. Four central shafts were sunk from surface on the North Minnesota fissure, which joined the contact at about 300' depth. The Michigan mine is a combination of two entirely new mines and a reopened old mine, its shafts being sunk on the Calico amygdaloid, a bed outcropping 140' north of the Minnesota contact vein and a few feet north of the North Minnesota fissure. In addition to the Calico lode, Minnesota contact, North contact and Branch vein, the Michigan tract carries the Knowlton, Mass, Ogima and South Amygdaloid beds, also an unnamed amygdaloid farther south, these latter belonging to the Evergreen belt, worked a few miles to the northeastward by the Mass and Adventure mines. The Knowlton, or northernmost of the Evergreen series of parallel lodes, is about 1,000' south of the old Minnesota shafts, and a 7' amygdaloid, supposed to be the Butler, has been opened to some extent in Peninsula Bluff, 2,000' south of "B" shaft, this showing heavy copper and stamp rock. There are three old shafts on the Butler lode, also an adit cutting several parallel cupriferous beds. There also are copper-bearing amygdaloid outcrops north of the Calico bed, on which no work has been done.

The Calico parallels the contact vein, and the old Minnesota has been reopened by crosscuts, simultaneously with the development of a new mine on the Calico itself, which has been opened for nearly a half mile, and the making of a second new parallel mine on the Branch vein. The country rock is a melaphyr trap and the Calico amygdaloid ranges from almost a trap to nearly a conglomerate, carrying considerable felsite, with occasional patches of sandstone and large quantities of epidote, prehnite and calcite. The strike is approximately N. 68° E., with a dip of about 46° 30' and a width of 5' to 25', averaging about 9' wide. Most of the copper occurs in a 2' to 3' pay-streak near the footwall, though occasional good patches occur

in the center and on the hanging wall. The copper carries a little silver and is mostly in nodules, called shot-copper, with a little barrel-work and occasional small masses, the heavy copper occurring mainly near the intersections of numerous cross-fissures filled with clay gouge. The lode is strong, standing well without timber, and is sinuous both as to strike and dip, with very irregular walls, the amygdaloid bed merging into the trap footwall by almost imperceptible degrees. There also is a tendency to split, the "footwall vein" being rich in such cases, but leaving the main bed very lean in copper. There is also a "hanging-wall vein," and branch veins, in addition to which the Minnesota contact and North Minnesota fissure are found within 140' distance of the Calico. In fact, the entire section between the Calico and the Minnesota contacts, and for a little distance on either side, comes very nearly being a sort of magnified stockwork, where copper may occur at almost any point, even where least expected.

There are three shafts on the Calico, "A," the westernmost, being about 1,000' on the strike of the lode from the boundary line of the National mine. This has 3 compartments, and is 7x18' inside of timbers and 1,781' deep. The lode runs as wide as 18' in places and shows some excellent ground. Stopping is in progress on numerous levels.

"B" shaft, with 2 compartments, is 985' east of "A" and also is 1,781' in depth. The lode runs 20' to 25' wide in places and the lower levels show some good stopes on the Calico. This shaft has a Burnham sinking pump, with capacity to fork 400 gallons per minute from a quarter-mile depth. The "Branch Vein" is opened from this shaft, this ore body lying between the Calico and the Minnesota contact, closely underlying the former on the fifth level but receding therefrom steadily until it touches the contact vein just above the thirteenth level, but rolling away therefrom again. The "Branch Vein" is narrow, but very rich, showing many masses up to 15 tons or more in weight, and has been opened from the fifth to the thirteenth levels by crosscuts. The old Minnesota was unwatered from "B" shaft by drill holes, bored across at each successive level. The old workings were found in very bad shape after three decades of neglect, and the contact vein is reached by crosscuts on the eleventh and thirteenth levels, below the bottom of the old workings, showing a vein of about 20' width, with 6' to 7' on the hanging wall richly mineralized.

"C" shaft is 1,353' northeast of "B" and 346' deep, with a little drifting on three levels. The formation is more settled than to the westward and the copper showing is better than was secured in the other shafts at similar depth, but no work is in progress at present. There is room on the Michigan lands for an additional shaft west of "A." The mine has a total of between five and six miles of underground openings, and works about 30 power drills.

The Branch vein is furnishing about half the copper now made by the mine, although it is furnishing but one-third of the rock tonnage, that is, the Branch is about twice as rich as the Calico, the former yielding about 32 lbs. refined copper per ton as compared with 16 lbs. from the latter. Daily rock production is about 480 tons, of which approximately 160

tons is from the Branch and 320 tons from the Calico. The width of the Branch is 2' to 8', with an average of 4', but as the vein dips at approximately 58°, ample head-room is allowed for working, without beating away worthless rock. The Branch carries mainly mass and barrel copper, with considerable stamp rock. The showing throughout the openings in the Branch is almost uniformly good, and it affords stoping ground from end to end of every opening. The showing of heavy copper is the best now made by any Lake Superior mine, and the average of 480 lbs. per fathom, or 32 lbs. refined copper per ton, puts the Branch ahead of the Champion and Wolverine mines, and second only to the Calumet & Hecla among Lake Superior copper producers. The Branch vein has been opened for a quarter mile laterally, and has been traced for two miles. Openings on the Branch are being secured about twice as fast as ground is stoped, which means that ground is being opened at the rate of about 325 tons daily, which rate can be increased a little later. The mass copper found throughout the Branch vein, in pieces weighing from a few hundred pounds up to 20 tons each, affords a very pretty sight, and two men, using pneumatic chisels, are employed steadily in cutting these masses into pieces suitable for hoisting.

The engine house, standing midway between shafts "A" and "B," is to be 50x115' when completed. The "A" section is 48x50' and has a 24x60' double-cone straight-face Webster, Camp & Lane hoist, with a 7' drum having a 15' face, carrying 4,000' of cable and capable of raising 4-ton skips in counterbalance at rate of 3,500' per minute from a depth of 3,200'. The hoisting cable passes around solidly anchored sheaves, giving a straight pull at each shaft. At "B" shaft there is a temporary 13x16" double hoist with 6' drum, which will be replaced, eventually, by a permanent hoisting plant installed in the main engine house. The rockhouses are duplicates, of wood, with 800-ton storage bins, each having a 50-h. p. Nordberg engine, two 18x24" crushers, one 13x20" crusher and a steam-hammer to handle barrel copper and small masses. The main power plant and engine house, adjoining "A" engine house and eventually to be flanked by "B" engine house, has two 165-h. p. Burt boilers, with room for more, and a Cochran water-heater and purifier. There is also a 40-drill Ingersoll-Sergeant two-stage air compressor, with surface condenser and intercooler, and auxiliary compressors of 5, 10 and 12-drill capacity. The boiler house is 36x40', with a 12' coal storage addition.

The smithy is of stone, with three forges. There is a 30x60' machine shop, carpenter shop, warehouse, office building and a model 22x50' changing house. Water is supplied by the old Minnesota dam, the mine and location having mains and hydrants, with a Knowles pump in the basement of the powerhouse capable of raising a 5" steam against a 400' head, and an auxiliary Deane pump, 200' distant, capable of raising a 5" steam against a head of 425'. There are acetylene gas plants in the powerhouse and in each rock-house, and a 250' coal trestle, with inclined tunnel and tramway underneath, leading to the boiler-house. All buildings are connected by a private telephone system, and the mine is served by the Mineral Range railroad.

Production was begun Nov. 12, 1903, with one leased head at the Mass mill, working day-shifts only. Since the spring of 1904, the stamp has worked double shifts. The lease of the Mass stamp expires Nov. 1, 1905, and it is evident that the Michigan must figure upon erecting a mill of its own, as the Mass may need both its own stamps, though the proposed compounding of the heads, increasing the mill's capacity to about 1,500 tons daily, would afford ample crushing facilities for both mines for another year or two.

The Michigan was making about 170 tons of 75% mineral monthly, equal to about 125 tons refined copper, or at the rate of 3,000,000 lbs. yearly, at the close of 1904. Production never has been crowded, and has shown a gradual increase since first begun. The mine is earning considerable profits, estimated at about \$12,500 per month, or \$150,000 per year, at the close of 1904, but because of the future necessity for a mill, early dividends need not be anticipated. The management, both local and eastern, is as nearly perfect as any mine has, and the Michigan has passed the experimental stage, and must be ranked among the assured successes in Lake Superior copper mining.

MICHIGAN COPPER & GOLD MINING CO.

UTAH.

Office: care of T. G. Love, treasurer, Salt Lake City, Utah. Mine office: Frisco, Beaver Co., Utah. Organized December, 1902, under laws of Utah, with capitalization \$300,000, shares \$1 par. Michael H. Osborne, president; L. C. Van Voorhis, secretary. Lands, 4 claims, area 80 acres, known as the New York group, in the San Francisco district, near the Horn Silver mine, opened by a 40' shaft, and idle.

MICHIGAN-MEXICAN MINING CO.

MEXICO.

Office: Care of R. Skiff Shelden, president, Houghton, Mich.; Chas. M. Taylor, superintendent.

MICHIGAN MINING CO.

WYOMING.

Office: care of D. W. Gill, Cheyenne, Wyo.

**MICHIGAN & MONTANA COPPER MINING
& SMELTING CO.**

MONTANA.

Office: Kalispell, Mont. Mine office: Altyn, Teton Co., Mont. J. M. Harris, manager. Lands, sundry claims some distance from rail transportation, giving fair assay values in auriferous and argentiferous copper ores. Has a 100-ton concentrator.

MICHIGAN-NEW MEXICO COPPER CO.

NEW MEXICO.

Office: Grand Rapids, Mich. Mine office: Lordsburg, Grant Co., N. M. J. L. Hamilton, president; C. R. Luton, secretary and general manager; Wm. H. Stevens, superintendent. Lands, 4 claims, area 80 acres, known as the Dakota-Pearl mine, in the Burro Mountains, about 15 miles from the Santa Rita mines. Ores give assays up to about 8.5% copper, \$3 silver and \$4 gold per ton. Has a 280' shaft and plans installing a 50-ton leaching and cyanide plant, and a smelter.

MICHIGAN SMELTING CO.

MICHIGAN.

Office: 27 State St., Boston, Mass. Works office: Houghton, Houghton Co., Mich. Organized 1903, under laws of Michigan with capitalization

\$500,000, shares \$25 par. Wm. A. Paine, president; Frederic Stanwood, secretary and treasurer; Frederick I. Cairns, general manager; preceding officers, John Stanton and Chas. H. Paine, directors; Frank Klepetko, consulting engineer.

The plant is located about three miles west of Houghton, near the old Atlantic stamp mill, with frontage on Portage Lake. It was designed by Frank Klepetko and is the largest and most modern in the Lake Superior district, with a capacity of 90,000,000 lbs. yearly, built to smelt the mineral of the Stanton and Copper Range groups, including the Phoenix, Mohawk, Wolverine, Atlantic, Baltic, Trimountain, Champion, Winona and Michigan mines.

The plant is terraced throughout, permitting economical and largely automatic handling of material. The terraces for the different structures are sand-graded, with stone retaining walls. Mineral is delivered to the works in 40-ton bottom-dumping steel cars, by the Copper Range railroad, which also hauls away the refined copper, for shipment from the Copper Range wharves in West Houghton. The 3,000-ton mineral storage bins, holding ten days supply for the works, are located on the upper terrace. Mineral is dehydrated in rotary dryers, by waste gases from the furnaces, taken to the furnaces in tram-cars and dumped into hoppers on the charging floor. The trestles, on an upper plateau, hold 15,000 tons of hard and soft coal, with separate storage compartments for charcoal, sand and limestone. Tunnels under the coal-trestle lead to the boiler-rooms and furnace, fuel being delivered in tram-cars, with a down-grade for loaded cars.

The main furnace building is 160x205', of steel and brick, with truss roof and has 3 reverberatories, each 18x50' in outside measurement, with 880 sq. ft. of hearth surface, taking 15-ton charges every 4 hours, giving a daily smelting capacity of 90 tons each, these being the largest reverberatories ever constructed. In actual practice much trouble has been had with two of these large reverberatories. The difficulties experienced in working have been two in number. The charges, owing to their great weight, have broken through the bottom walls on different occasions, and difficulty has been experienced in furnishing adequate heat for such a large grate surface. This has been added to, perhaps, by the total lack of sulphur in the mineral smelted, the sulphur in ores and concentrates smelted in reverberatory furnaces in other districts aiding in the making of heat. As a consequence of the trouble experienced with two of these large furnaces, they are being rebuilt somewhat smaller, on the same general plan as the Calumet & Hecla and Quincy reverberatories, for treating the mineral of the Wolverine, Mohawk, Atlantic and Michigan mines. The third large furnace will be retained.

There has been much criticism of the Michigan Smelting Company's new plant—much of it ungenerous and unjust. The plant was designed throughout by Frank Klepetko, who stands second to no designing engineer and metallurgist in the world. It embodied many new features, and was a long step in advance of any plant heretofore erected in the Lake district.

Trouble has been had with one thing only, among the many new features. It should be remembered that the Anaconda reduction plant, also designed by Mr. Klepetko, was pronounced a failure by the critics, yet has proven a success in every detail—not a qualified, but an unconditional success. The leaders of the world's progress, in metallurgy as in all other fields, are ever subject to a fire in the rear, from the disappointed and the envious. The proper correlation of theory and practice sometimes is no easy matter, but it comes in time, if the theory be good. If stronger walls and greater heat be needed for smelting Lake Superior native copper in reverberatories of such great size, doubtless they can be secured by alterations.

Alternating with the reverberatories are one 300-h. p. and two 200-h. p. Stirling water-tube boilers, heated by waste-gases from the furnaces. After leaving the boilers the waste-gases are drawn through a 6x8' subterranean flue with arched roof up the hill to a 150' stack with base 100' above the furnace building. The reverberatory building has two 5-ton electric traveling cranes.

From the reverberatories the molten copper goes to two blast furnaces, on a lower level north of the reverberatories, where blister copper is cast mechanically in moulds upon a circular table, cooled in water and carried by a link elevator to the loading platform. The cupola building is 40x70', of steel and brick, with two floors. Slags are carried mechanically to the sampling mill, and reduced in a 30-ton crusher of 1,000 tons daily capacity for resmelting. The waste slags from the final fusion are granulated by jets of water and discharged through launders to low ground northward, for grading.

The combination machine shop and power-house, of steel and brick, has a complete equipment of shop tools, with independent engine, and a 300-h. p. Nordberg horizontal tandem compound engine driving a 200-kw. generator actuating the rotary blowers for the blast furnaces. Electric power is used extensively for operating the drying plant, casting machinery and electric cranes, and also for lighting purposes, and actuates three specially designed Jeffrey electric locomotives of 100-ton draw-bar pull, taking current from overhead trolleys and hauling 8 pressed steel Sheffield mineral and coal cars, tracks reaching practically every part of the plant.

Miscellaneous buildings include a combination two-story and basement office and laboratory, of brick, heated by exhaust steam, also a 40x60' iron-sheathed frame warehouse, barn, etc. The plant has two 50' track-scales of 150 tons capacity each, one for mineral and one for coal and flux, with smaller scales at other points. Water is obtained from the old Atlantic dam, on Cole's Creek, through a 4,300' flume, with capacity of 5,000 gal. per minute, leading to a 50,000-gallon water-storage tank, 100' above the works, giving good pressure at all buildings.

MICHIZONA DEVELOPMENT CO.

ARIZONA.

Office: care of George J. Maas, president, Negaunee, Mich. Mine office: Pearce, Cochise Co., Ariz. Has 60,000 shares; 20,000 unissued. Albert J. Houle, superintendent. Lands, 18 claims, known as the Leadville group, near the Copper Belle, in the Turquoise district, bought for \$100,000, opened

by a 280' shaft, showing 24" to 30" of 4% sulphide ore, from depth of 175' to bottom of shaft. Management will develop by drifting on the 300' level. Equipment includes a 25-h. p. gasoline hoist. Management is experienced and financially strong, and property is well regarded.

MICHOACAN SAN FRANCISCO COPPER MINES**MEXICO.****SYNDICATE, LTD.**

Voluntarily liquidated.

JOSÉ MICULICICH.**PERU.**

Office and mine: San Tadeo, Yauli, Peru. Is a small producer of argenteriferous copper ore.

MIDDLEMARCH COPPER CO.**ARIZONA.**

Office: 212 Henne Bldg., Los Angeles, Cal. Mine office: Middlemarch, Cochise Co., Ariz. Organized April 26, 1897, under laws of California, with capitalization \$1,000,000, shares \$100 par. H. Bert Ellis, president; M. M. O'Gorman, vice-president and general manager; Dr. Wm. LeMoyne Wills, secretary; Angel Moreno, mine superintendent; M. E. Anderson, mill superintendent. Lands, 23 claims, area 460 acres, in the Middlemarch district, showing 6 parallel veins, of which 2 under development range 30' to 80' in width and give average returns of 4% to 5% copper, from nothing to 10% zinc, 2 oz. silver and 60c. gold per ton, opened by a 625' tunnel and shafts of 100' and 305'. Veins show nearly all varieties of ore, chalcopyrite predominating. Mine has about 4,000' of underground openings, giving about 200,000 tons of ore in sight and company estimates 100,000 tons blocked out for stoping. Has a 60-h. p. steam plant at the mine and 100-h. p. plant at smelter. Mine engine house, 30x38', is of stone and iron, with a 32x38' boiler house. Concentrator is 40x60', of wood, with one 8x12" Blake crusher, 2 trains of rolls, 2 Bartlett tables, 1 slime table and 3 sizers. The smelter, 30x40' and 3 stories high, is of wood and concrete, connected by tramway with the mine. Smelter capacity is 40 to 60 tons daily, plant having a blast furnace turning out matte of 55% to 70% in copper tenor, with variable gold and silver values. Nearest railroad, 8 miles, is the Arizona & Colorado. Mining costs average about \$2 per ton and smelting costs about \$5 per ton. New work planned includes a 3-compartment shaft and a new hoist. Ore was free smelting at surface, but became refractory at depth, through deficiency in lime and iron, hence smelter was closed until large bodies of sulphide ore were opened at depth. Company has authorized a \$200,000 bond issue, and with proceeds plans sinking a large working shaft and erecting a large concentrator. Work on the concentrator is planned to start May, 1905. Management is considered honest, and property is regarded as valuable.

MIDLAND GOLD, COPPER & REDUCTION CO.**UTAH.**

Office and mine: care of Albert Swingewood, secretary and treasurer, Hot Springs, Box Elder Co., Utah. G. B. Dean, president. Organized 1904, to develop a group of 14 claims in the Sierra Madre district, 2 miles from Hot Springs.

MID MOONTA COPPER MINES, LTD.**AUSTRALIA.**

Reconstructed as Moonta Central Copper Co., Ltd.

MIDNIGHT MINE.**ARIZONA.**

Office and mine: care of St. Charles Bros., owners, Chloride, Mohave Co., Ariz.

MIEDNOROUDIANSK MINE.**RUSSIA.**

Mine office: Bogoslovsk, Nijni Tagilsk, Perm, Russia. An old and famous copper producer, notable for great variety of copper minerals, including copper oxides, carbonates, silicates and phosphates, with occasional native copper, and is especially notable for large pieces of massive malachite, one mass of 330 tons having been found in 1836. Supposed to be operating in a small way.

MILFORD COPPER MINING & SMELTING CO.**UTAH.**

Office: 5 Walker Bank Bldg., Salt Lake City, Utah. Mine office: Milford, Beaver Co., Utah. Organized 1902, under laws of Utah, with capitalization \$300,000, shares \$1 par. Geo. H. Dern, president; Chas. E. Hudson, secretary and treasurer; Frank H. Lathrap, general manager. Lands, 11 claims, area 220 acres, lying near the O. K. mine of the Majestic Mining & Smelting Co.

MILFORD GOLD & COPPER MINING CO.**UTAH.**

Mine office: Milford, Beaver Co., Utah.

C. S. MILLS & CO.**MEXICO.**

Office and mine: Sierra de Oro, via Horcasitas, Sonora, Mex. C. S. Mills, general manager. Lands, 103 hectares, known as La Colorado group, also a 6-hectarea millsite, in the Ures district, showing 5 veins or dykes, ranging 2' to 100' in width, occurring as fissures in porphyry and contacts between porphyry and phonolite, carrying gold, silver, copper, nickel, cobalt and platinum. Mine is opened by a 100' shaft and a 440' tunnel, and is equipped with steam power and a small stamp mill and concentrator of 15 to 20 tons daily capacity. Nearest railroad is the Sonora branch of the Southern Pacific, 25 miles distant. Employ about 25 men.

MILTON MINE.**MICHIGAN.**

Office: care of Byron N. White, owner, Spokane, Wash. Lands, 880 acres, between the Norwich and Victoria mines, Qntonagon county, Michigan. Never a producer.

MILTON COPPER CO.**MICHIGAN.**

Affairs wound up, December, 1902, and property sold for \$468.40.

MILWAUKEE-MONTANA NATURAL BRIDGE**MONTANA.****GOLD & COPPER MINING CO.**

Office: 127 Third St., Milwaukee, Wis. Mine office: Contact, Park Co., Mont. J. M. McNulty, manager. Ores carry gold, silver and copper. Has water power and 5-stamp mill, employing about 20 men.

MILWAUKEE-PALMER MOUNTAIN GOLD & COPPER MINING CO.**WASHINGTON.**

Office: 23 Metropolitan Block, Milwaukee, Wis. Property supposed to be in vicinity of Palmer Mountain, Washington.

SOCIEDAD DE MINAS y FUNDICION.**CHILE.**

Mine office: Carizal Alto, Freirina, Atacama, Chile. Operates the Portozuelo, Armonia and 12 other mines. The Armonia, about 1,200' in depth, has been a considerable producer for some years.

MINDOULI MINE.**FRENCH CONGO.**

Mine office: Comba, via Brazzaville, French Congo State. Has a limited amount of development, but is not a producer.

MINE DEVELOPMENT ASSOCIATION.**NEW MEXICO.**

Mine office: Socorro, Socorro Co., N. M. Cony T. Brown, manager.

MINERAL CREEK COPPER CO.**ARIZONA.**

Letters returned from former mine office, Globe, Gila Co., N. M. Property was the Hummer Group.

MINERAL CREEK MINING CO.**ARIZONA.**

Had copper lands in Pinal County, Arizona, circa 1881. Dead.

MINERAL CREEK MINING & SMELTING CO.**WASHINGTON.**

Office: 515 California Bldg., Tacoma, Wash. Mine office: Mineral, Lewis Co., Wash. Harold Howes, superintendent. Ores carry gold, silver, lead and copper. Has water power and 20-ton smelter, employing about 25 men.

MINERAL HILL CONSOLIDATED COPPER CO.**ARIZONA.**

Office: Carlisle, Ky. Mine office: Tucson, Pima Co., Ariz. Organized under laws of Arizona, with capitalization \$3,000,000, shares, \$1 par. W. H. Martin, president; Boon Ingels, vice-president and treasurer; Wm. F. Ramsey, secretary; Thos. Hughes, Sr., superintendent. Lands, 26 claims, area 520 acres, in the San Xavier district, 18 miles southwest of Tucson, including the Azurite group of 13 claims, which has produced about \$550,000 worth of ore, also the American group of 8 claims and the Mineral Hill group of 5 claims. The various properties of the company are opened by 74 pits and open-cuts, 48 shafts, mostly shallow, and 8 tunnels, giving a total of about 6,000' of underground openings, said to show about 45,000 tons of ore blocked out for stoping, claimed to average 10.2% copper and \$3 in combined gold and silver values per ton, with about 40,000 tons of ore on the dumps, estimated to average 8.3% copper and \$3 per ton in gold and silver. Mine also has a large body of sulphide concentrating ore averaging about 3.5% copper. The property has a small smelter with 2 Allis-Chalmers water-jacket blast furnaces. Management considered good and property promising.

MINERAL HILL COPPER SYNDICATE, LTD.**ARIZONA.**

Controlled by Argyle Mining Co., Ltd.

MINERAL HILL MINING CO.**WASHINGTON.**

Office: 49 West 125th St., New York. Mine office: Conconully, Okanogan Co., Wash. Samuel Lloyd, president; A. R. Lacey, secretary; E. P. Wheeler, superintendent. Has cupriferous silver-lead ores, developed by tunnel. Has steam power and crusher, and plans installing an air compressor. Employs 10 to 12 men.

MINERAL HILL MINING & SMELTING CO.**CALIFORNIA.**

Office: 237 12th St., San Francisco, Cal. Mine office: Spenceville, Nevada

Co., Cal. C. C. Bitner, manager. Lands, 5 claims, on which considerable development has been secured by a 535' tunnel. Ores carry gold and copper. Has water power and plans installing a small smelter. Employs 10 men.

MINERAL MINING CO.

OREGON.

Mine office: Huntington, Baker Co., Ore. H. C. Stratton and A. J. Crook, managers. Has steam power and small smelter.

MINERAL MOUNTAIN CLAIMS.

CALIFORNIA.

Office: care of D. T. Callahan, owner, Keswick, Cal. A group of 6 unpatented claims lying 3 miles south of Iron Mountain, Shasta Co., Cal., on which a sulphide ore body has been opened by a 200' tunnel.

MINERAL MOUNTAIN MINING CO., LTD.

NEW MEXICO.

Mine office: Stein's Pass, Grant Co., N. M. Chester W. Maxson, superintendent. Ores carry silver, lead and copper. Has steam power.

MINERAL POINT MINING CO.

COLORADO.

Mine office: Marble, Gunnison Co., Colo. L. Hoffman, superintendent. Lands include the Carbonate group, carrying cupriferous gold and silver ores. Has gasoline power and 50-ton smelter, employing about 25 men.

MINGINER COPPER SYNDICATE, LTD.

AUSTRALIA.

Offices: 216, Mansion House Chambers, London, E. C., Eng. Mine office: Minginer, Western Australia. C. Mullen, secretary. Capitalization, £5,000. Holds copper property on lease. Moribund.

MINGUS MOUNTAIN COPPER CO., LTD.

ARIZONA.

Office: 516 Grant Bldg., Los Angeles, Cal. Mine office: Jerome, Yavapai Co., Ariz. R. A. Thomas, president; J. R. Thomas, secretary; W. H. Leighton, mine superintendent. Organized March, 1900, under laws of Arizona, with capitalization \$3,000,000, shares \$1 par. Lands, 38 claims, area 750 acres, in the Black Hills district, showing 3 fissure veins, of which 2, carrying oxide and sulphide ores, are being developed by 3 shafts, deepest 370', with 3,555' of underground openings, on an ore body having an extreme width of 40' and traceable 4,000'. Has steam power. Company's funds low at last accounts, but management considered honest and property promising, and officers are to be commended for keeping mine idle rather than running into debt.

MINNEAPOLIS COPPER MINING &

WYOMING & MONTANA.

MILLING CO.

Letters returned unclaimed from former office, Minneapolis, and former mine offices, Boulder, Jefferson Co., Mont., and Encampment, Carbon Co., Wyoming.

MINNEHAHA MINE.

MONTANA.

Office and mine: care of Dodge & Kilburn, owners and operators, Basin, Jefferson Co., Mont. Mine is 2 miles from Basin, opened by a 200' tunnel showing two narrow veins, with pay-streaks of 8" giving 18% copper, and 8" showing 13% copper, 13 oz. silver and \$2 gold per ton. Shipped a little ore in 1904.

MINNEHAHA COPPER-GOLD MINING CO.

WASHINGTON.

Office: 30 Court St., Boston, Mass. Mine office: Danville, Ferry Co.,

Wash. Organized under laws of Maine, with capitalization \$50,000, shares \$1 par. Ernest C. Wood, consulting engineer; S. L. Boyer, superintendent. Lands, 4 claims, area about 70 acres, opened by several shallow shafts and a 206' tunnel, and a new tunnel started, planned to be 1,124' long. Mine shows a vein giving assays of \$14 to \$60 in gold and copper, with a 12" pay-streak assaying \$40 per ton. Made first shipment of ore Dec. 15, 1903. to Granby smelter, and made shipments, during 1904, giving net returns of \$250 to \$400 per car. Management seems vigorous and honest, and property is regarded as promising.

MINNESOTA MINE.**MICHIGAN.**

Company wound up. Mine now owned by Michigan Copper Mining Co.

MINNIE GULCH MINING & TUNNEL CO.**COLORADO.**

Mine office: Silverton, San Juan Co., Colo. S. G. Martin, superintendent. Ores carry gold, silver and copper. Has steam power.

MINNIE HEALY MINING CO.**MONTANA.**

Office and mine: Butte, Silver Bow Co., Mont. E. H. Wilson, superintendent. United Copper Co. owns 95% of stock issue. Mine also is claimed by Boston & Montana company and is the subject of extensive and continuous litigation. Property, adjoining the Leonard and Colusa mines of the Boston & Montana, is opened by a 1,000' two-compartment main shaft, and is connected underground with the Leonard, Rarus and Tramway mines. Is operated by the Hypocka company, when not tied up by litigation, employing about 200 men.

MINNIE MABEL GOLD & COPPER MINING CO.**WYOMING.**

Mine office: Rambler, Carbon Co., Wyo. H. G. Richardson, president and general manager. Lands, 9 claims, area 180 acres, near the Doane-Rambler mine, in the Battle Lake district.

MINONG MINE.**MICHIGAN.**

The most important property ever developed on Isle Royale, Michigan. Has several shafts, deepest 300'. Opened 1874, closed 1879, after making 249 tons, 650 lbs. refined copper.

MINONG RANGE COPPER CO.**WISCONSIN.**

An idle exploration at Gordon, Douglas Co., Wis., described in Volume III.

MINOVACA MINE.**WASHINGTON.**

Mine office: care of Wells & Evans, owners, Bossburg, Stevens Co., Wash. Ores carry gold and copper.

MINT GROUP.**WASHINGTON.**

Office: care of D. F. Strobeck, owner, Spokane, Wash. Lands, on Gold Hill, near Myers Falls, Wash., show 3 veins, of 8' to 25' width, giving assays of 8% copper, 5 oz. silver and \$8 gold per ton.

N. MIRANDA y CA.**CHILE.**

Office and mines: Freirina, Atacama, Chile.

MISKWABIK DEVELOPMENT ASSOCIATION, LTD.**MICHIGAN.**

Office: Lake Linden, Mich. Mine office: Phoenix, Keweenaw Co., Mich. Employs 13 men. Organized January, 1903, under laws of Michigan, with capitalization \$35,000, shares \$1 par. Charles Smith, president; Alfred

A. Guck, secretary; Joseph Bosch, treasurer; James Chynoweth, superintendent; Richard Edwards, mining captain. Litigation over title to part of tract was settled in company's favor, June, 1904. Lands, 400 acres, adjoining the Central mine at the southwest, in Section 5, T. 57 N., R. 31 W., and Section 32, T. 38 N., R. 30 W. Explorations were started in June, 1903, under the advice of Dr. L. L. Hubbard, and a lode, identified as the Kearsarge, was speedily located about 4 miles northeast of Mohawk shaft No. 1, the northernmost opening previously made on the Kearsarge bed. The amygdaloid has been opened by three pits, sunk through the overburden into the ledge. The permanent shaft, sunk on the incline of the lode, has drifts running north and south, at a depth of 116', these drifts showing highly encouraging ground. Surface plant includes a 24x44' engine and boiler house, with steam hoist, 6-drill air compressor and 240-h. p. boiler. Work was resumed in December, 1904, and the showing secured is highly encouraging. Property is under option to H. F. Fay, and it is planned to merge the Miskwabik, Federal and part of the Union Copper Land & Mining Company's holdings, in a corporation to be called the Miskwabik Mining Co.

MISKWABIK MINING CO.**MICHIGAN.**

It is proposed to form a company of this title, in 1905, to take over the lands of the Miskwabik Development Association, Ltd., also sundry adjoining lands of the Union Copper Land & Mining Co., and The Federal Copper Co., the new company to be under the management of H. F. Fay. Lands to be contributed are 400 acres from the Miskwabik, 360 from the Federal and 200 from the Union, giving a total area of 1,000 acres.

MINA MISMA MATRACAL.**MEXICO.**

Office and mine: Indé, Durango, Mex. Reinaldo E. Avila, owner and manager. Ores carry copper and silver. Has steam power.

MISSOULA COPPER MINING CO.**MONTANA.**

Office: Mullan, Idaho. R. R. McCormick, president; Henry Billings, secretary. Is developing fair looking claims by a 1,000' tunnel. Management seems honest and business-like.

MISSOURI COPPER CO.**MISSOURI.**

Letter returned unclaimed from former mine office, 50 State St., Boston, Mass.

MISSOURI COPPER MOUNTAIN MINING CO.**MISSOURI.**

Office: 632 Century Bldg., St. Louis, Mo. Mine office. Sullivan, Crawford Co., Mo. Capitalization \$1,000,000, shares \$100 par. L. M. Barnard, president; W. H. H. Myers, secretary; M. P. Welton, superintendent. Lands, 74 acres owned in fee, 690 acres leasehold and options on 7,428 acres adjoining, in Crawford, Franklin and Washington counties, Missouri. Mine was worked in a small way before the middle of the Nineteenth Century. Development is by 4 shafts and tunnels of 240' and 1,000', showing carbonate ores with hematite gangue and heavy clay gouge, said to average about 10% copper. Has steam power and concentrator with 16" Blake crusher, 18" and 22" rolls, 4 New Century jigs, Card concentrating table and hydraulic classifiers. Smelter has a 40-ton Allis-Chalmers water-jacket furnace, with

Root blower. Country rock is magnesian limestone, ore body having a good gossan capping, with vein showing chalcopyrite and iron pyrites in the sulphide zone.

MITCHELL DEVELOPMENT CO.

ARIZONA.

Office: Calumet, Mich. Mine office: Bisbee, Cochise Co., Ariz. Capitalization \$300,000, shares \$10 par. Chas. Smith, president; John R. Ryan, vice-president; Wm. A. Bateman, secretary; Joseph Vertin, treasurer. Lands, 33 claims, area 660 acres, in Montezuma canyon, Huachuca Mountains, Cochise county, Arizona. The topography is very rugged and a considerable portion of the holdings are fairly timbered. Lands include at least one antigua, worked for silver-lead ores by the Spaniards, probably as early as nearly 300 years ago. Country rocks are red shale, quartz and limestone, with granite-porphry intrusions. A pocket of zinc ore was opened at surface, and the zinc and lead indications are excellent. Development is by 2 shafts and 3 tunnels, operations being considerably scattered. Main shaft is down about 250', cutting a 3' to 4' vein of ore at a depth of about 200', this showing chalcopyrite, bornite, chalcocite, and occasional native copper, the ores assaying up to 12.5% copper and 4 oz. silver per ton, with traces of gold. Equipment includes 2 gasoline hoists, these being used in preference to steam, owing to the aridity of the district. Property is connected with Bisbee by roads that are good in summer, but a bridge across the San Pedro river is needed for winter communication. Company was practically reorganized, with complete change of officers, early in 1905. Resumption of work is planned by new management.

MITCHELL MINING CO.

MEXICO.

Offices: 52 Wall St., New York; 522 Bradbury Bldg., Los Angeles, Cal., and 1302 F St. N. W., Washington, D. C. Mine office: care of La Dicha Mining & Smelting Co., Chilpancingo, Guerrero, Mexico. Employ's 350 to 400 men. Organized April 16, 1902, under laws of Arizona, with capitalization \$5,000,000, shares \$10 par. Geo. Mitchell, president and treasurer; Thos. H. Anderson, vice-president; C. E. Crary, secretary; Robt. E. Morrison, general counsel; preceding officers Geo. A. Fitch and W. F. Bottsford, directors; E. D. Elson, general manager; H. S. Fairchild, assistant secretary; Tomás Macmanus, counsel; Harry Mitchell, manager New York office; Edward Noon, mine superintendent. American Natl. Bank, Los Angeles, registrar and transfer agent. Direct title to property is held by La Dicha Mining & Smelting Co., S. A., stock of which Mexican corporation is owned by the Mitchell Mining Co.

Mining lands, 1,800 pertenencias, area 4,446 acres, include La Dicha, Mitchell, McKinley, Edward VII, Hensey, Odell and Last Chance groups, having a total area of 754 pertenencias, giving holdings of a solid parallelogram of one by seven miles, with the axis of the tract along the strike of the vein. These lands are in the districts of Bravos and Tavares, State of Guerrero, about 25 miles in an air line from Acapulco, one of the best ports on the Pacific. In addition to mineral holdings there are about 18,000 acres of plantation lands and 164,000 acres of virgin timber lands, latter carrying

medium and high-grade woods, including some good oak, yellow pine, and hardwoods, assuring an abundant supply of timber for mining, building and commercial purposes for decades to come. All lands are owned in fee. The district is fertile and healthy, with an excellent climate, the temperature averaging 74° Fahrenheit. El Rincon ranch, area 18,000 acres, has 8,000 coffee trees, 16,000 cacao trees, pineapples, oranges, etc., and also grows corn and other cereals and vegetables, beside grazing large herds of cattle and flocks of sheep, the ranch furnishing all food supplies for the workmen employed at the mines.

The principal mining property is La Dicha group, about 2,000' above sea-level, comprising various locations on a continuous vein of sulphide ore upwards of 5 miles in length, continuity being proven by a heavy gossan capping and also a series of mountain streams that have crosscut the vein down to the sulphide zone at intervals of a quarter to a half mile, the width of this ore body varying from 150' to 225'. Country rocks are granite-porphry, limestone, schists and quartz, the ore body having a granite foot-wall and schistose hanging. This ore body has been exposed to a depth of 745' at one point, by a stream cutting through, and is estimated by Mr. Mitchell to contain at least 9,000,000 tons of 4% self-fluxing sulphide ore. In addition to this copper vein, the company has upon its extensive landed holdings promising bodies of coal and iron ore, with sundry ores of silver and gold. Below the gossan and above the chalcoppyrite that forms the great bulk of the ore in La Dicha vein, is a layer of 1' to 6' of chalcocite, ranging from slightly disseminated to massive, and assaying 50% to 74% in copper tenor. Tunnel No. 2 shows about 12,000 tons of this extremely rich ore. The vein-matter is essentially pyrrhotite, pyrite and chalcoppyrite, forming a perfectly self-fluxing ore and obviating all necessity for concentration.

The development of the mine has been aided greatly by nature in cross-cutting the vein at numerous points. The Rio Alcaparosa parallels a considerable portion of the vein, receiving as affluents numerous smaller streams that have cut across the vein at approximately right angles. These streams have worn down their beds, sometimes for hundreds of feet, affording perfect cross-sections of the ore body.

Development has been and will continue to be mainly by tunnels, which will afford very cheap extraction for some years to come. The mine has 6 shafts and 12 tunnels, with a total of about 10,000' of openings, all of the shafts and tunnels being in ore. The principal developments are between shaft No. 1 and tunnel No. 8, a distance of about 2,800', in which are about 3,000' of shafts, tunnels, crosscuts and winzes, estimated to expose 4,500,000 tons of ore. Shaft No. 1 is 500' deep, with 2,030' of lateral openings; No. 2 is 105' deep; No. 3 is 300' deep, with 750' of laterals; No. 4 is 105'; No. 5 is 130', and No. 6 is 305' in depth. Tunnel No. 1 is 65' long, with a 58' crosscut; No. 2 is 151' long, with a 192' crosscut; No. 3 is 130'; No. 4 is 253'; No. 5 is 74'; No. 6 is 690', with a 118' crosscut; No. 7 is 338', with a 49' crosscut; No. 8 is 470', with a 485' crosscut; No. 9 is 640'; No. 10 is 85'; No. 11 is 358'

and No. 12 is 308' in length. Tunnels Nos. 4, 6, 8, and 9 have tram-tracks. All shafts are of full 2-compartment size, solidly timbered and equipped with temporary wooden shaft-houses, iron-sheathed. The mine was very carefully sampled early in 1905, in 10' sections, average assays by sections running 2.25% to 8% in copper tenor, with an average of 4+%. Owing to mine being opened by tunnels no heavy machinery plant is required. The power plant includes two 60-h. p. hoists, boilers, air compressor, power drills, etc. The company has a general store and a village of dwellings, small but comfortable, for its workmen. The supply of native labor is ample, and the workmen are fairly efficient, wages ranging from 29 cents to 42 cents gold, per day, for natives.

About 3 miles from the southern end of the mine is the Rio Papagalla, giving an available head of 200', if reached by a tunnel of about 1,000' length, which would develop about 8,000-h. p. in the dry season. There also is a smaller water-power available, on the Rio Alcaparosa, for which a 350-h. p. plant has been ordered, for the operation of 4 hoists, 10 power drills, a sawmill, ice-plant and electric lighting. These two streams can be made to develop about 20,000-h. p., or twice the estimated power required for mining and railroad use.

The smelter site, at a 75' water-fall, is ample to accommodate a very large reduction plant. The smelter has a 200-ton Mitchell economic hot blast furnace. This is an invention of the president of the company, but is not an experiment, being in successful daily use at the Copper Queen, Greene Consolidated, United Verde and Boston & Montana mines, four out of the ten largest copper mines of the world. The present plant is to be enlarged after the completion of the railroad.

The Mexico, Cuernavaca & Pacific branch of the Mexican Central railway is already in operation across the Rio Balsas, and is to be completed to Acapulco, in addition to which the Mitchell company plans building a 75-mile electric railroad to the coast, this to be of narrow gauge, with maximum grades of less than 2%, operated by water power and to cost approximately \$250,000. It is estimated that coke can be delivered to the smelter at \$7.50 per ton, when the railroad is completed, but pending the securing of rail connections, the smelter will burn charcoal and ship the matte produced on muleback to the coast. The company's railroad will be known as La Dicha & Pacific. The railroad company has been organized under the laws of Arizona, with a capitalization of \$2,000,000. In addition to handling the Mitchell company's business, the road will secure an extensive and profitable traffic from the sugar haciendas, ranches and timber tracts along its line. The southern terminus will be at San Marques, a port 5 miles south of Acapulco, controlled by the company. The Mexican government has granted exemption from import duties on rails, bridge material, rolling-stock and equipment of every nature for the railroad, and has granted similar exemption on machinery required by the mine.

The property of the Mitchell Mining Company is one of altogether unusual magnitude. Its ore body is of enormous size, and while the principal

values are in low-grade disseminated chalcopyrite, the ore is self-fluxing, and should require no concentration. When given adequate transportation facilities, the mine will enjoy considerable advantages in the way of cheap fuel and labor costs. George Mitchell, president and general manager of the company, is a practical smelterman of long experience, having been in charge of the works of the Boston & Montana, United Verde and Greene Consolidated, three of the largest copper producers of the globe. There has been some talk of paying dividends during 1905. Such an action would be a mistake. While dividends might be squeezed out of the small production of the present smelter, the money earned could be used to infinitely better advantage, for two or three years to come, in increasing the mine openings and enlarging the smelting plant. The Mitchell is a property of such great size and promising future as to justify opening and equipment upon a scale commensurate with its size and promise. A dollar in the treasury always is worth more, to a new mine, than two dollars in dividends.

MITSU BISHI GOSSHI KWAISHA.

JAPAN.

Office: Mitsui Bishi Bldg., Yayascho Itchome, Kojimachi-ku, Tokio, Japan. Principal mine office: Hanawa, Kazuno, Rikuchu, Japan. T. Nanbu, president; S. Harada, vice-president; S. Sho, secretary; R. Tayakawa, treasurer; A. Yamada, general manager. Company is an extensive producer of copper, its principal mines being the Osaruzawa, Ikuno, Yoshioka, Kamioka, Sado, Arakawa and Hisanichi.

The Osaruzawa mines are at Hanawa, Rikuchu. K. Ishihara, superintendent; K. Okamoto, smelter superintendent; W. Matsuhashi, mine superintendent; K. Ikeda, mill superintendent; T. Kawamura, engineer. These are very ancient mines, opened in the Eighth Century, but were worked for gold only until circa 1650, when copper ores were developed. Lands, about 1,000 acres, with 200 acres miscellaneous lands, in the Kazuno district. Ore is mainly chalcopyrite, with occasional bornite and a little native copper, associated with iron pyrites and small quantities of hematite, sphalerite and galena. Native gold is found also, mixed with the copper ores, and in a quartz fahlband, gold values occurring mainly in the upper workings. Veins are very numerous, ranging in width from 5" to 30', with an average of perhaps 3'.

These veins are very persistent in strike, and hold workable to an average depth of about 500', traversing Tertiary shales and tuffs, with intrusive augite-andesite and liparite. The Osaruzawa mines are opened by 8 working shafts, deepest 470', and 7 main tunnels, longest 7,500', and have upwards of 15 miles of underground workings. The smelter has two 40-ton water-jacket blast furnaces and a 250-h. p. electric plant, turning out blister copper 99.09% fine, and extensive additions in the way of new hoisting, dressing and smelting machinery are contemplated. The Osaruzawa mines employ about 1,000 men, and in the 1,200 years of operation, have produced immense quantities of gold, silver and copper. Production in 1902 was 2,448,000 lbs. refined copper, with considerable gold and silver values.

The Ikuno mines, at Ikuno, Tajima, are under the general superintendence of T. Hori. These valuable mines were discovered A. D. 807, and

in the period 1596-1620 were extensively worked under the management of the Tokugawa government, being taken over by the Imperial government in 1868 and sold to the present owners in 1896. The three principal mines of this group are the Tasei, Kanagase and Kasei. The Tasei mine has a principal vein averaging 14' in width, with numerous branches, traversing liparite, propylite and Tertiary tuffs, carrying argentite, native gold and silver, chalcoppyrite, malachite, sphalerite, galena and iron pyrites. The Kanagase mine, near by, has the same country rocks as the Tasei, but is traversed by basalt dykes, a great fault-seam 30' to 40' in width, filled with brecciated country rock, carrying 6 veins, with chalcoppyrite, bornite, tetrahedrite, native copper, argentite, stibnite, sphalerite, pyrrargyrite and galena. The Kasei mine has a country rock of diorite, traversed by liparite and propylite dykes, metalliferous veins occurring in the diorite and carrying chalcoppyrite and native silver, with ores of antimony, lead, zinc and silver. Production of the Ikuno mines in 1900 was 984,355 lbs. of refined copper, 1,260,932 momme of silver and 29,620 momme of gold. The group employs about 1,000 men and has steam, water and electric power.

The Arakawa and Hisanichi mines, at Arakawa-mura, Senhoku-gori, Ugo, are under the general superintendency of M. Ooye. The Arakawa, formerly known as the Ugaisawa mine, was reopened 1871, and after passing through various hands was bought by the present owners in 1896. Country rocks are of Tertiary and Quaternary ages, including hornblende-andesite, liparite and propylite, numerous parallel veins being found in the propylite, with strike approximately northeast and southwest. The Hisanichi mine, near the Arakawa, has argentiferous chalcoppyrite, associated with iron pyrites and sphalerite. Production in 1900 was 566,268 lbs. refined copper. The property shows 6 principal veins, the largest known as the Ugaizawa-ohi, averaging about 24' width, with one-third pay ore, but occasionally branching into several small veins. The other workable veins range 5' to 7' in width. Ore is chiefly chalcoppyrite associated with iron pyrites and frequently carrying native copper, cuprite, chrysocolla, sphalerite and galena, with a quartz gangue. The property has water and electric power and a 50-ton smelter, employing about 1,200 men. Production in 1900 was 1,734,522 lbs. of refined copper.

The Yoshioka mine, at Fukiya-mura, Kawadami-gori, Bitchu, has water and electric power, with a 50-ton smelter and employs about 1,000 men, with M. Fujioka as general superintendent. Property was very difficult of access until a new road was built by the Mitsui company. The mine was opened circa 1806 and has been worked continuously since then, but was never a large producer until taken by the present owners, in 1873. Ore is chalcoppyrite, associated with iron pyrites, pyrrhotite and sphalerite, with quartz gangue, and averages 9% copper after dressing. Ore occurs in veins in country rocks of clay slate, sandstone and schalkstein, traversed by porphyry dykes. Production in 1900 was 1,722,000 momme of silver and 1,081,346 lbs. of refined copper.

The Sado mines, at Arakawa-cho, Island of Sado, 425 miles from Tokio, have Y. Uriu as general superintendent. The property was owned by the

Mikado, and operated as a sort of government mining school, until 1898, when bought by the Mitsu Bishi company. The mines have auriferous and argentiferous copper ores, and are equipped with steam, water and electric power, and an exceptionally good plant of modern mining machinery.

The Makamine mine, located in Kitakata-mura, Higashi-Usuki-gori, Hyuga, was a dead mine until reopened recently by the Mitsu Bishi company. The ore is chalcopryrite, associated with iron pyrites, averaging 3.5% to 4% copper. Production for 1900 was 1,208,282 lbs. of refined copper.

The Kamioka mine at Funatsu, Yoshiki-gori, Hida, is essentially a silver-lead mine, the ores consisting mainly of argentiferous galena, sphalerite and chalcopryrite, associated with chrysocolla, malachite, iron pyrites and arsenopyrite. B. Matsuda and C. Tanikawa are superintendents. The property has steam and electric power and a smelter. Since bought by the Mitsu Bishi company, in 1885, production has increased materially, the property now employing about 600 men. Output in 1900 was 537,487 kin of lead, 8,475 lbs. of copper and 148,670 momme of silver.

The Sawatari mine at Kitakata-mura, Higashi-gori, Hyuga, adjoins the Hibira mine. Ore occurs as small lenses in paleozoic claylate and sandstone and production in 1900 was 137,191 lbs. refined copper.

The Mozumi mine, at Kamioka-mura, Yoshiki-gori, Hida, is an old property, opened 1573, near the Kamioka mine, and is primarily a silver-lead mine, but secures a little copper as a by-product. Production for 1900 was only 8,475 lbs. refined copper, or about one-tenth as much as was secured in 1897.

The Mitsu Bishi Gosshi Kwaisha shares with the Furukawa Copper Company the honor of leading in the Japanese copper industry. Its management is exceptionally broad and intelligent, and the operations of the company are attented by deserved financial success.

MITTERBERGER KUPFERGEWERKSCHAFT.

AUSTRIA.

Mine office: Mühlbach, Salzburg, Austria. A small producer, working a vein of 6' to 9' width, carrying auriferous and nickeliferous chalcopryrite.

MIZUSAWA MINE.

JAPAN.

Mine office: Iwasaki-mura, Waga-gori, Rikuchu, Japan. Mines two 3' veins, at junction of granite and liparite. Ore is chalcopryrite, in quartz gangue. Production in 1900 was 200,331 lbs. fine copper. Owned and operated by the Furukawa Copper Co.

MOBILE MINE.

GEORGIA.

An old and idle mine, slightly developed, in Fannin county, Georgia.

MINA MOCTEZUMA.

MEXICO.

Mine office: San José de Guadalupe, Durango, Mex. Roman Gaitau, owner and manager. Has developed a copper ore body by tunnel.

MOCTEZUMA COPPER CO.

MEXICO.

Office: 99 John St., New York. Mine office: Nacozari, Sonora, Mex. Employs 600 men. Organized under laws of West Virginia, with capitalization \$3,000,000. Jas. Douglas, president; A. C. James, vice-president; Geo. Notman, secretary and treasurer; Jas. S. Douglas, superintendent; J. S. Wil-

liams, Jr., assistant superintendent; Geo. Kingdon, mine superintendent; J. K. Stanfill, concentrator superintendent; D. S. Giddings, engineer; Dr. A. Sandberg, metallurgist; Geo. M. Douglas, superintendent motive power. Lands, in the Moctezuma and Arizpe districts of Sonora, include the Pilares de Nacozari mine, 6 miles east of Nacozari, also the Juárez and Nicolas ranches, area about 35,000 acres, the mine lying in a rough, hilly country, near the divide between the Yaqui and Oposura rivers. The ore occurs in a broad friction zone in which the original rock has been broken into masses ranging in size from gravel up to many tons in weight, the country rock in this crushed zone being the matrix of the ore, which is auriferous chalcopyrite and occasional bornite, associated with iron pyrites, with no clearly defined footwall and with a hanging wall dipping at an angle of about 80°. There is a small outcrop of rich carbonate ore, but croppings are mainly red-stained porphyry showing considerable low-grade hematite. The leached zone is about 20' in depth only, with pay-ore coming in at 60'. The ore body apparently is about 800' wide by 1,500' long on surface, the area increasing at depth. The matrix is a fine-grained silicious rhyolite, and the ore is said to average about 2.5% in copper tenor, as mined, before concentration. Development is mainly by tunnel, the 3,500' Porvenir tunnel having 20" gauge railway tracks, with extensive drifting at either side, and having storage bins in a 25x100' chamber, to which ore is milled down from the upper workings. A long tunnel now driving is planned to tap the ore body at a depth of nearly one-half mile. The main working shaft is 600' deep, with 4 levels opened, showing some enormous stopes, one of which, No. 4, on the 3d level, is 85' high, 125' wide and 150' long.

The 600-ton concentrator is in 2 sections, equipped with 2 Blake crushers, 4 sets of 54x3" roughing rolls, 2 sets of finishing rolls, 24 revolving screens, 48 Hartz jigs, ten 5' Huntington mills, 56 six-foot Frue vanners, 20 Bartlett tables, hydraulic classifiers and 7 settling tanks. Slimes from the settlers are worked by vanners exclusively, and rolls are used in crushing, to obviate sliming as far as possible. Tailings are reground and treated on Frue vanners. This concentrator, which was designed by Dr. L. D. Ricketts, saves upwards of 90% of the original ore values, although the ore is not easily amenable to treatment. The power equipment of the concentrator includes five 50-h. p. motors, eight 30-h. p. motors and one 20-h. p. motor.

The plant has steam and gas power, mainly the latter, which has proven more economical. The gas plant has Loomis-Pettibone generators, making both producer and water gases, which are stored in separate gasometers of 15,000' and 5,000' capacity, respectively, gases being mixed in due proportions before use. The consumption of fuel is under 3 lbs. of very inferior wood per h. p.-hour. The power plant has 8 single-cylinder 100-h. p. Crossley gas engines of the 4-cycle type, with 18.5" cylinders and 24" stroke, making 200 revolutions per minute, each direct-connected to a 65-kw. direct-current generator, and one 200-h. p. Crossley engine driving a 150-kw. generator. Power for the various departments of the concentrator and smelter is furnished from this central station, current being distributed at

250 volts to some 40 motors, installations ranging from 5 to 175 horse power. The gas engines are started by compressed air, requiring only one to three impulses. The plant has arc and incandescent electric lights throughout. Buildings are mainly of steel, with a brick machine shop. Water is pumped from a well in the river, by one triplex and three Worthington pumps, to a reservoir, and wash-water from the concentrator is settled and used repeatedly.

The smelter, five miles from the mine and connected therewith by a narrow-gauge railroad, has two 42x130" elliptical water-jacket furnaces of the Copper Queen type, with tilting wells on the side, which can be tilted both front and rear. A 75-h. p. dynamo furnishes blast. Fumes from converters and furnaces pass into an 8' horizontal steel flue leading to a 750' brick flue discharging into a 70' brick stack. The converter department has 2 stands with 9'x6' 8" shells of the Copper Queen type. The smelter was closed September, 1904, upon completion of the railroad line from Cos to Nacozari, all concentrates going to the Douglas Reduction Works.

The company has a general store, and maintains both English and Spanish schools. Native labor is paid \$2 to \$3, Mexican, per 10-hour day. Production was 9,584,099 lbs. refined copper in 1902, and 9,632,000 lbs. in 1904. The company has expended several millions of dollars in development work, and despite the very low grade of the ore, and its refractory nature, has opened and equipped a successful mine and plant. The company is controlled by Phelps, Dodge & Co., which is equivalent to saying that the management is of the very best, in every respect.

MODEL GOLD MINING CO.

ARIZONA.

Office: 1431-79 Dearborn St., Chicago, Ill. Mine office: McCabe, Yavapai Co., Ariz. T. F. Murphy, president and treasurer; F. E. Verry, vice-president; Chas. T. Joslin, general manager; A. C. Massey, superintendent. Lands, 6 claims, known as the McCabe mine, in the Chapparral section of the Big Bug district, opened by a 750' incline shaft, with about 12,000' of underground openings showing several ore bodies, with an 8" to 10' pay-streak of shipping ore, and 12" to 24" of milling ore carrying about 2% copper, the first-class ore carrying gold, silver and copper values of \$35 to \$80 per ton. The country rock is granite, with numerous intrusive porphyry dikes, the granite being much shattered. The water-level is found at a depth of about 40', below which the ore is an iron sulphide, carrying small percentages of copper, lead and zinc, all auriferous and argentiferous.

The mine has a good steam plant, burning petroleum. The mill has 10 stamps, a 50-ton Elspass mill, 1 Wilfley and 3 Standard tables. Production is at the rate of about 2,000 tons of ore monthly, of which about 12% is smelting ore. The company was promoted by Frank T. Jaeger, who was indicted for fraudulent use of the mails. Under Jaeger's management the company sold stock and paid dividends simultaneously, with the usual disastrous results. The company seems to have eliminated Jaeger from the management, and property is under the local direction of C. T. Joslin, who is both honest and competent. The mine seems to be one of exceptional promise.

MODERN COPPER MINING CO.**ARIZONA.**

Office and mine: Bisbee, Cochise Co., Ariz. Organized 1901, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. N. A. Centers, president; O. H. Briggs, vice-president and general manager; R. A. Miller, secretary. Lands, 28 unpatented claims, area 500 acres, in the north-western end of Tombstone Canyon, Warren district, showing 5 fissure veins carrying carbonate and sulphide ores, of which one is slightly developed, this giving average assays of 7% copper, 10% lead, 14 oz. silver and 1 oz. gold per ton. Has steam power and four shafts of 40', 50', 100' and 225'. Idle.

MODOC MINE.**NEW MEXICO.**

An idle property in Donna Ana county, New Mexico. When under lease to Prof. Correra, several years ago, was a good producer of lead-copper-silver ores.

MOGOLLON GOLD & COPPER CO.**NEW MEXICO.**

Mine office: Cooney, Socorro Co., N. M. Capitalization \$1,000,000, shares \$1 par. Thomas F. Curran, president; Wm. Jenks, vice-president and consulting engineer; Geo. L. Brooks, secretary; Wm. J. Weatherly, general manager; T. F. Cooney, mine superintendent. Lands, 26 claims, area nearly 500 acres, in 5 groups, known as the Cooney, Peacock, Little Charley, Independence and Fluoride, in the Mogollon Mountains, about 85 miles northeast of Silver City, the nearest railroad point. The Peacock mine has a 400' shaft, about 1,500' distant from the Cooney shaft, and connected therewith by drifts on several levels. The Cooney group of 9 claims is developed by a 550' two-compartment main shaft. The mine is opened on a fissure vein in porphyry and andesite that averages 5' to 10' width, with occasional width much greater, and carries a paystreak of 3' to 30' width, with numerous narrow feeders, some of which carry very high values in gold. Ores are principally slightly auriferous and highly argentiferous chalcopryite, bornite and chalcocite, with silver values increasing in depth. The Cooney has 6 levels opened and the Cooney and Peacock were producers of ores to the estimated value of \$1,250,000 in the past.

Surface improvements include a good steam plant, hoists, 10-drill straight-line Sullivan air compressor, machine shop, electric-light plant and a considerable number of dwellings, also a 5,000' sawmill, run by water power, and a general store. The 100-ton mill, started Jan 1, 1904, puts about 8 into 1, turning out concentrates of \$80 to \$100 per ton gross values. The mill has 800-ton ore-bins, 2 sets of 84x24" rolls, one 3' and one 3' 6" Huntington mill, one Dodge crusher, 7 Frue vanners and 3 Wilfley tables, effecting a saving of about 85% of the crude ore values. Power is furnished by an 80-h. p. steam engine, and 30-h. p. Pelton wheel, latter having water power, available about 6 months yearly. The Cooney is handicapped by lack of rail facilities, but seems to be prospering, and paid a 2.5% dividend in 1903. The management is good and property is well regarded.

MOHAWK MINING CO.**MICHIGAN.**

Office: 15 William St., New York. Mine office: Kearsarge, Mich. Mill office: Gay, Mich. Organized November, 1898, under laws of Michigan,

with capitalization \$2,500,000, shares \$25 par, \$21 paid in. Annual meeting, last Tuesday in March. Boston Safe Deposit & Trust Co., registrar. American Loan & Trust Co., of Boston, transfer agent. John Stanton, president; John R. Stanton, secretary and treasurer; Fred Smith, superintendent; preceding officers, Jos. E. Gay and Wm. A. Paine, directors; Willard J. Smith, assistant superintendent; Frank Getchell, clerk; B. S. Shearer, mill superintendent; John Trevorrow, mining captain; F. Wm. Hartmann, engineer.

Official returns to the state of Michigan, as of date Jan. 1, 1904, disclose the following figures:

Amount cash paid in on capital stock	\$1,799,258.00
Amount paid by conveyance of property to company ...	450,000.00
Entire amount invested in real estate	456,236.17
Amount of personal estate	353,813.80
Amount of unsecured or floating debt.....	100,359.83

Mineral lands, 800 acres, are in an irregular tract having its axis on the strike of the lode, in Sections 27, 28, 33 and 34, T. 57 N., R. 32 W., Keweenaw county, Michigan. The Kearsarge amygdaloid lode, on which the mine is opened, outcrops for about one mile on the Mohawk tract and the deepest shaft can be sunk on the dip of the lode for nearly one and a half miles on the company's lands. The Mohawk is 4 miles northeast of Calumet, and has the Ahmeek and Seneca on the north, the Bacon & Jacob tract on the east and south, and the Ahmeek on the west. The southern boundary is a trifle more than one-half mile from the northern boundary of the Kearsarge mine of the Osceola Consolidated, and the southernmost shaft is about two miles northeast of the northernmost shaft of the Wolverine, opened on the same lode. The Mohawk, formerly known as the Fulton, was supposed to lie too far east to carry the outcrop of the Kearsarge lode, until the Kearsarge bed was found, accidentally, by the cutting of a wood-road, circa 1896. The property carries sundry other cupriferous amygdaloid beds, which may be given attention later, work wisely having been confined to development of a mine on the Kearsarge bed.

Crossing the amygdaloid bed, at approximately right angles and with nearly vertical dip, are 3 fissure veins carrying sundry arsenides of copper, including stibio-domeykite, mohawk-whitneyite, mohawkite and keweenaite, the latter being peculiar to this mine and described in the chapter on mineralogy. The most important commercially is mohawkite, this occurring in considerable quantities in the upper north drifts of No. 1 shaft, the vein ranging 3" to 3' in width and being mineralized at the crossing of the amygdaloid, and for an indefinite but usually short distance on either side. The mohawkite and allied arsenides of copper occasionally occur massive, but commonly are disseminated in an arenaceous gangue, and after hand-cobbing carry values of \$100 to \$150 per ton. On the 6th and 7th levels the mineral contents of the principal fissure vein are small, and apparently the production of mohawkite for the future will be trifling.

The Mohawk has 4 shafts, numbered from north to south. No. 1, about 1,500' south of the point where the outcrop of the lode passes over the north-

ern line, is 980' deep, and improving at depth. No. 2, about 1,100' next southwest, is 700' deep. No. 3, 1,100' next southwest, is 667' deep. No. 4, 1,300' next southwest, is 500' deep. No. 5, the southernmost and newest shaft, started 1904, is 70' deep only. The shafts are of uniform size, 8x18' inside of timbers, with solid cribbing through the overburden, and are to have identical equipments. Shafts 1, 2 and 4 have duplicate Nordberg compound conical-drum hoists, good for a depth of 6,000' and similar hoists are to be installed eventually at No. 3 also. Shafts 1, 2, 3 and 4 have combination shaft-rockhouses, fitted with 12x24" Nordberg engines and rock-crushers. The lode runs 15' to 18' wide, or about the same as at the Wolverine, and is somewhat richer than the Wolverine was at similar depth, but not so rich as the Wolverine now is in its bottom workings. The openings from No. 1 shaft and the north drift from No. 2 are almost uniformly good. Between shafts Nos. 2 and 3 there is some poor ground, though this section shows improvement at depth. No. 4, the poorest shaft of the mine near surface, is now possibly the best at depth, the south drifts showing exceptionally rich ground, while the highly favorable developments at the Ahmeek, south of No. 4, insure a continuance of rich ground to the boundary line. No. 5 shaft, the southernmost, started August, 1904, is 1,800' south of No. 4, and the showing secured at slight depth is decidedly good, and there are indications that the best values in the mine may be found to the south. The mine is running about 40 power drills.

A new boiler plant has been built at No. 2 for shafts 1 and 2, the engine-house and boiler-house being of mine rock with redstone trimmings. No. 4 has a redstone boiler and engine-house, and there are engine and boiler-houses at No. 3 shaft also. The equipment at No. 5 is temporary throughout, but will be replaced later. The hoist at No. 5 is an old straight-face drum from No. 1. The new shaft has a temporary rock-house with one crusher, and rock broken in development work will be milled, beginning early in 1905. A 60-drill, 4,000' Ingersoll-Sergeant air compressor was installed in 1904, at No. 4 shaft, and the old compressor at No. 3 shaft is maintained as an auxiliary. Miscellaneous surface improvements include a machine-shop, smithy, combination carpenter shop and warehouse, 30x40' office building, and a new and well equipped hospital.

The Mohawk is reached from the south by the Mineral Range railroad and is connected with its mill by the Mohawk & Traverse Bay railroad, with 13 miles of main line, owned jointly by the Mohawk and Wolverine companies, and operated under contract by the Mineral Range railroad.

The Mohawk mill, standing opposite the Wolverine mill, is at Gay, near the mouth of the Tobacco river, on Traverse Bay, Lake Superior. A 20,000,000-gallon triple-expansion Snow pump furnishes water for both mills, the pumphouse standing near the river, from which water is taken. The mill, planned for four heads, is 178x206' in size, of steel frame sheathed with iron, on foundations of sandstone quarried from the company's own lands. A steel trestle, 350' long and 50' in extreme height, leads into the mill, loaded cars being pulled up this incline by a winding engine. Three

stamps are in commission, the third having started Jan. 22, 1904, and a steepie-compound head has been contracted for in addition. The mill has 3 sets of crushing rolls, with fixed bearings, to reduce the oversize material from the mortar-boxes of the heads, this averaging 20% to 25% of the gross amount of rock stamped. A steel boiler-house adjoining the mill has four 250-h. p. Stirling water-tube boilers. The mill is equipped with the latest washing machinery and has a Chilean regrinding mill and trolley carriers for barrel copper. The townsite at the mill, named in deserved honor of Jos. E. Gay, long and actively identified with honest and successful copper mining in the Lake Superior district, has streets, water-mains and hydrants, with a number of substantial dwellings occupied by employees. The wharf on Traverse Bay, a short distance from the mill, is 30x300', with 14' of clear water alongside, and is fitted with coal-hoists and storage sheds, ample for the needs of both the Mohawk and Wolverine mines.

The Mohawk has not come up to the earlier estimates of copper percentages, but is doing excellently and earning large profits. The mine has by no means reached its full productive capacity, and will make one of the largest producers of the Lake Superior district in time. A considerable surplus has been accumulated from net earnings, and, as predicted one year ago, probably will be in shape to declare its first dividend this year. The management is of the best, and the Mohawk can be depended on to give a good account of itself. Production, 1904, was 8,149,515 lbs. fine copper.

MOJAVE COPPER CO.

CALIFORNIA.

Mine office: Red Rock, Lassen Co., Cal. R. D. Finnie, manager, at last accounts. Has secured assays of 13% to 30% copper.

MOLLIE GIBSON GROUP.

BRITISH COLUMBIA.

At Menzies Bay, Discovery Passage, Nanaimo district, B. C. A promising ore-body was encountered in 1901. Since idle.

MOLLIE STARK COPPER MINING CO.

WYOMING.

Office: care of Dr. G. A. Thomas, 92 North State St., Chicago, Ill. Mine office: Encampment, Carbon Co., Wyo. J. M. Thomas, Jr., general manager. Has a 400' tunnel opening a contact vein, and has shipped a little ore over the aerial tram of the Penn-Wyoming Copper Co. to the latter's smelter.

MONA & PARYS MINES, LTD.

WALES.

Offices: Anlwyh, Anglesey, Wales. E. J. Abbott, chairman; H. D. Harrod, secretary. Organized Jan. 13, 1899, with capitalization £75,000, shares £1 par; issued, £55,000. Debentures, £20,000 at 6% and £10,000 at 7%. Lands, 1,067 acres, with improved water-frontage, warehouses, tramways, etc. Makes a little copper by cementation from mine-waters. Mines in this district were worked by the Romans. The Parys mine was opened 1768, and made 3,000 tons of copper in 1784. Present production is 25 to 50 tons fine copper yearly.

MONARCH CONSOLIDATED GOLD & COPPER MINING & SMELTING CO.

COLORADO.

Office: Boulder, Colo. Organized under laws of Colorado, with capitalization \$1,000,000, shares \$1 par. Lands, 2 groups, known as the Copper

King and Gold groups, area 1,740 acres, on the South Fork of the Grand river, in Grand county, Colorado. Is installing water power.

MONARCH COPPER MINING CO.

CALIFORNIA.

Office: 326 Post St., San Francisco, Cal. Mine office: Callahan, Siskiyou Co., Cal. C. F. Pattey, president; Chas. K. Dickenson, secretary and treasurer. Organized under laws of South Dakota, with capitalization \$200,000, shares \$1 par. Lands, said to be 640 acres, claimed to show two veins carrying cuprite, melaconite, malachite, azurite, chalcocite, bornite and chalcoppyrite, said to be opened by a 200' tunnel and claimed to give assays of 11.25% copper and \$2.50 gold per ton, with traces of silver. Also said to have a vein of auriferous and argentiferous galena.

MONARCH GOLD & COPPER MINES, LTD.

BRITISH COLUMBIA.

Letters returned unclaimed from former office, Portland, Oregon, and former mine office, Nelson, B. C.

MONARCH GOLD & COPPER MINING CO.

ARIZONA.

Office: 219-53 State St., Boston, Mass. John B. Hathaway, president; Geo. E. Warren, secretary; G. P. Morrill, treasurer; C. L. Barker, general manager. Lands, are in the Big Bug district of Yavapai Co., Arizona, showing slightly cupriferous gold ores. Idle.

MONARCH MINING, MILLING, TUNNEL,

COLORADO.

TRANSPORTATION & POWER CO.

Mine office: Idaho Springs, Clear Creek Co., Colo. Geo. E. McClelland superintendent. Property is the Freeland mine, carrying ores of gold, silver, copper and lead. Has electric power and employs about 25 men.

MONARCH MINES & SMELTERS CORPORATION.

UTAH.

Office: care of A. B. Lewis, Salt Lake City, Utah. Organized 1904, with capitalization \$30,000,000, to take over sundry Nevada and Utah copper properties.

MONARCH MINING & SMELTING CO.

ARIZONA.

Mine office: Wickenburg, Maricopa Co., Ariz. Organized August, 1904, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Lands, 4 claims, held under working bond and lease, 9 miles east of Wickenburg, opened by a tunnel showing considerable ore, estimated by company at 50,000 tons averaging \$8 per ton values in copper and gold, former predominating, ores assaying 3% to 20% copper and \$3 to \$15 gold.

MOND NICKEL CO., LTD.

ONTARIO.

Offices: 39, Victoria St., London, S. W., Eng. Mine office: Victoria Mines, Algoma, Ont. Works office: Clydach, Wales. Registered Sept. 20, 1900, with capitalization £600,000, in 300,000 ordinary shares, par £1, 50,000 deferred shares, par £1, and 50,000 cumulative 7% preference shares, par £5. Dr Ludwig Mond, F. R. S., chairman; Robt. Mathias, secretary; Dr Bernard Mohr, general manager; Hiram Hixon, mine manager. Lands, 3,350 acres freehold and 1,550 acres leasehold under 3-year option, in the townships of Blezard, Denison, Snider and Garson, Sudbury district, Algoma, Ontario, carrying cupriferous and nickeliferous pyrrhotite, quite extensively developed. The Victoria mine, which is the principal producer, has a 650'

vertical 3-compartment shaft, 4x12' inside of timbers. The 8th level, at the bottom, shows the ore bodies maintaining both width and grade. The North Star mine, lying northeast of the Creighton mine, in Snider township, has some development also. The Victoria mine shows 2 lenses of nickeliferous pyrrhotite and chalcopyrite, with east and west strike, connected by stringers, in schistose diorite near a granite contact. The Victoria mine has separate shafthouse and rockhouse at No. 1 shaft, with 5 and 10-drill Rand straight-line air-compressors, hoists, etc.

An 11,000' Bleichert aerial tram connects the Victoria mine with the roast-heaps and smelters, the tramway being self-operating, owing to steep incline secured. The works also have direct rail connection with the Canadian Pacific railway. The smelter building, of steel, sheathed with corrugated iron, has 2 water-jacket blast furnaces, 2 stands of converters, traveling cranes, and a power plant with five 100-h. p. return tubular boilers, Riedler air-compressor, 2 Connersville blowers with direct-connected engines, and a 125-kw. dynamo. Owing to the mine and smelter producing far ahead of the capacity of the refinery, work was suspended and the smelter leased to the Massey Station company during 1904.

The refining works are in the Swansea Valley, at Clydach, Wales. The bessemerized copper-nickel matte from the smelter is dead-roasted and treated with dilute sulphuric acid, which permits the extraction of about two-thirds of the copper and 2% of the contained nickel. The residue, after drying, assays 45% to 60% nickel, and is treated, in charges of 500 kg., with water-gas, in a reduction tower, at a temperature of about 300° Centigrade. This tower has shelves and the ore is removed from shelf to shelf by automatic rakes, the lower shelves being cooled. After treatment in the reduction tower the charge is transferred to a volatilizing tower and treated with carbon monoxide, at a temperature of about 100° C. The residue therefrom is returned to the reducing tower, and the charge goes forward and back between the two towers for 10 to 15 days, and when 60% of the nickel has been volatilized, as nickel carbonyl, the residue of the charge is returned to the roasting furnace. The nickel carbonyl is treated in a decomposing apparatus, wherein the metal is recovered in granules assaying 99.4% to 99.8% nickel. The copper is turned out as bluestone.

While designed upon theoretically perfect lines, the refinery gave much trouble at first, from leakage of the deadly gases, and in various other ways. Practice finally has been made to correspond with theory, and the company should be able to make very substantial profits for the future.

MONITOR MINE.

MONTANA.

At Butte, Silver Bow Co., Mont. Owned by Anaconda Copper Company and leased to Michael O'Farrell. G. A. Harrington, superintendent. Mine is a small producer of argentiferous copper ore, and is connected underground with the J. I. C. and Ground Squirrel mines.

MONITOR MINING CO.

BRITISH COLUMBIA.

Letters returned unclaimed from former mine office, Alberni, Vancouver Island, B. C.

MONTAGNAT MINE.**NEW CALEDONIA.**

Mine office: Diahot, New Caledonia. A new property, in process of development, said to have an ore body of considerable size.

MONTANA & ARIZONA CONSOLIDATED COPPER CO.

Charter surrendered and company disincorporated.

MONTANA & ARIZONA COPPER MINING CO.

Letter returned unclaimed from former office, 68 State St., Boston, Mass.

MONTANA CONSOLIDATED MINING CO.**MONTANA.**

Letters returned unclaimed from former office, 79 Wall St., New York, and former mine office, Saltese, Missoula Co., Mont.

MONTANA COPPER MINING CO.**MONTANA.**

Letters returned unclaimed from former office, Helena, Montana, and mine office, Helmville, Lewis & Clarke Co., Mont. Secretary committed *felo de se*. Moribund.

MONTANA COPPER & GOLD MINING CO.**MONTANA.**

Controlled by International Copper & Gold Co.

MONTANA & MICHIGAN MINE.**MONTANA.**

Property of this name is said to have a 700' tunnel showing ore assaying up to 19% copper, on Canyon Creek, Teton county, Montana.

MONTANA MINERAL LAND DEVELOPMENT CO.**MONTANA.**

Office: Ferguson Blk., Pittsburg, Pa. Mine office: Basin, Jefferson Co., Mont. Employs 40 men. Organized 1902, under laws of Montana, with capitalization \$3,500,000, shares \$1 par; issued, \$2,700,000. Thomas C. Kelly, president; John G. Mizer, vice-president and treasurer; Frank J. Weixel, secretary; James Humes, general manager. Lands, 19 claims, area circa 300 acres, in the Cataract district. Country rocks are granite, showing fissure veins carrying sulphide ores, mainly chalcopyrite. One vein, of 100' width, is opened by an 850' shaft, and tunnels of 525', 1,400', 700' and 800', with 3,425' of lateral openings, giving average assays of 6% copper, 6% to 12% lead, 15 oz. to 30 oz. silver, and 20 cents to \$3 gold per ton. Company estimates 50,000 tons blocked out for stoping. Has steam plant of 200 h. p., with two 75-h. p. hoists, good for 2,000' depth, and a 4-drill Ingersoll-Sergeant air-compressor. Has a 20x40' log machine shop, 20x30' smithy, 24x30' carpenter shop, and 30x80' engine and boiler house.

Concentrator, of logs, is 35x120' with 7x10" Blake crusher, 1 train of rolls, eight 3-compartment jigs and 2 Wilfley tables. Concentrator is idle, present management confining attention to underground development. Property has produced 7,000 tons of ore, sold for \$166,238. Management is good and property is regarded as promising.

MONTANA MINING & DEVELOPMENT CO.**MONTANA.**

Office: 1007 Bessemer Bldg., Pittsburg, Pa. Mine office: Carter, Missoula Co., Mont. Employs 7 men. Organized Oct. 7, 1902, under laws of South Dakota, with capitalization \$1,000,000, in 2,000 shares of \$100 par and 800,000 shares of \$1 par; issued, \$525,000. Nelson Weddle, Jr., president; Chas. F. Rieger, vice-president; J. F. Hinckley, secretary and treasurer; W. A. Pray, general manager; Wm. Bryan, superintendent. Lands, 33

claims, area 660 acres, partly patented, also 85 acres of millsites, all timbered, in the Spring Gulch district. Country rocks are shale and quartzite, showing mineral bodies along fault-planes. Four ore bodies, of 4' to 50' width, are undergoing development, being opened by a 300' shaft and crosscut tunnels of 800' and 900', with a total of 3,200' of underground openings, estimated to show 10,000 tons of ore, with 500 tons blocked out for stoping, ore averaging 6% copper, 8% lead, 20 oz. silver and \$1.50 gold per ton. Ores are malachite, chalcocite, chalcopyrite, enargite and tetrahedrite. Company will continue development during 1905.

MONTANA ORE PURCHASING CO.

MONTANA.

Office: 31 Nassau St., New York. Mine office: Butte, Silver Bow Co., Mont. Organized 1883, under laws of Montana, with capitalization \$2,500,000; debentures, \$1,000,000 first-mortgage 6% bonds. F. August Heinze, president and general manager; John MacGinnis, vice-president; Arthur P. Heinze, secretary; Stanley Gifford, treasurer. Is controlled by the United Copper Co., which holds 76,791 shares out of 80,000 shares issued, and owns the entire issue of bonds. Property includes the Rarus, Snohomish, Tramway, Johnstown, Glengarry, Mountain Chief and other mines, a number of which are in litigation with the Amalgamated interests over titles, apexes, etc., and several of which are owned through subsidiary corporations, in accordance with the Montana plan of organizing a variety of companies upon a single property, to the great confusion of all earnest inquirers for fundamental facts. Company leases a 1,000-ton concentrator, at Basin, and operates a smelter at Butte.

The following table gives a summary of operations and results for the two past fiscal years, ending June 30:

	1903	1904
Tons of ore mined.....	293,332	224,080
Gross proceeds	\$3,587,691	\$1,694,045
Cost of mining	1,039,029	649,832
Cost of reduction.....	1,303,564	564,681
Cost of freight on ore	95,332	50,418
Cost of marketing, refining, etc.	548,514	504,800
Net proceeds.....	601,250	429,113
Gross yield, per ton	12.23	7.56
Cost of mining, per ton	3.54	2.90
Cost of reduction, per ton.....	3.62	2.52
Cost of transportation, per ton, cents.....	.325	.225

MONTANA SCOTCH BONNET COPPER & GOLD MINING CO.

MONTANA.

Office: Davenport, Wash. Mine office: Cooke, Park Co., Mont. C. A. Wilcox, superintendent. Lands include the Cora, Maggie and Jennie V. groups, carrying ores of gold, silver and copper, and employing 10 to 15 men, on development work, at last accounts.

MONTANA VERDE COPPER CO.

MONTANA.

Office: 21 Park Row, New York. Mine office: 82 Owsley Blk., Butte,

Silver Bow Co., Mont. Jos. Johnston, general manager; N. F. Norman secretary and treasurer. Organized 1902, under laws of South Dakota, with capitalization \$2,500,000, shares \$1 par. Lands, 16 claims, in the Bernice district of Jefferson county, 30 miles from Butte, showing a large body of low-grade ore, traversed by numerous small veins carrying high values in copper and gold, developed by tunnels of 275' and 350'. Has steam power and a 10-stamp mill, employing about 25 men.

MONTANA ZINC CO.**MONTANA.**

Mine office: Butte, Silver Bow Co., Mont. Clarence B. Wisner, president. Property is the Emma mine, formerly operated by the Butte Mining & Development Co., with an 800' shaft showing zinciferous ore carrying a little silver and gold, with prospects that copper may be found at greater depth. Has leased the Alice mill and purposes starting same early in 1905.

SOCIETE ANONIMA DELLE MINIERE DI**ITALY.****MONTECATINI.**

Offices: 49 Piazza Santa Apostoli, Rome, Italy. Mine office: Bocchegiano, Grosseto, Italy. Employs 700 men. Organized 1888, with capitalization 5,000,000 lire, shares 100 lire par. Dividends paid, 1899-1902, were 82 lire per share. I. Castelbognesi, president; Alfred Deschairs, vice-president; Alfredo Santori, secretary; Paul Marengo, general manager; Paolo Cerrina, superintendent; Guglielmo Vallada, engineer.

Holdings of this company include the Montecatini, Massetana and Bocchegiano mines, all very ancient properties, worked successively by the Etruscans, Romans, Goths and Italians. Massa Maritima, 20 miles distant, on the Mediterranean railroad, is the nearest station. The gangue of the Montecatini ores is a brecciated red porphyry carrying chalcopyrite, bornite, disseminated and massive chalcocite and occasional native copper, the ores averaging about 7% in tenor as mined. Present development is by one shaft of 125 metres and 5 tunnels, giving about 8,000m. of underground openings, with about 500,000 tons of ore in sight. The property is equipped with steam power and has a concentrator with 5 crushers.

The dressed ores sent to the smelter average about 36% for the Montecatini mine and about 11% each for the Massetana and Bocchegiano mines. The smelter, at Leghorn, has 4 reverberatory furnaces and a converter plant, also a sulphuric acid plant for the utilization of the sulphur, ores of 3.5% tenor in copper carrying about 40% sulphur. Annual production of the company is about 5,000 to 6,000 tons of 9% to 10% ore, 12,000 tons of cuprous pyrites averaging 3.5% copper and 21,000 tons of cuprous pyrites averaging 2.5% copper tenor. For the 7 years, 1895-1901, the company produced 257,332 tons of ore of all grades, the average being, for first grade, 10.67% copper; second grade, 3.44% copper and 45% sulphur; third grade, 2.67% copper, the average of all grades for 7 years being 3.68% copper and 28.15% sulphur.

MONTE CRISTO CONSERVATIVE MINING CO.**ARIZONA.**

Mine office: Paradise, Coshise Co., Ariz. Lands are sundry claims about two miles north of Paradise, at a site formerly known as Gayleyville.

MONTE CRISTO GOLD & COPPER CO.**UTAH.**

Office: 428 Dooly Bldg., Salt Lake City, Utah. Mine office: Milford, Beaver Co., Utah. Capitalization \$125,000, shares 25c. par. J. L. Craig, president; C. T. Wardlow, secretary and treasurer; Edw. Mingle, superintendent. Has about 1,605' of underground development, giving ores assaying up to 11% copper and 72 oz. silver per ton.

MONTE CRISTO MINE.**MONTANA.**

Mine office: Rimini, Lewis & Clarke Co., Mont. Idle.

MONTE CRISTO MINING CO.**ARIZONA.**

Office and mine: Metcalf, Graham Co., Ariz. Henry Brigham, president; Refugio Murillo, secretary and general manager. Lands, 5 claims, on Chase Creek, about 2 miles above Metcalf, carrying a fissure vein in porphyry showing 3' to 4' of oxidized ores assaying up to 45%, opened by a shallow shaft and tunnels of 100' and 200'. Made first shipment of ore to Shannon smelter May 1, 1904.

MONTEREY GOLD & COPPER MINING CO.

Disappeared from former office, 11 Broadway, New York.

MONTEREY GOLD MINING CO.**WASHINGTON.**

Mine office: Bolster, Okanogan Co., Wash. Ores carry gold, silver, copper and lead.

MONTEREY SMELTING & REFINING CO.**MEXICO.**

Office and works: Monterey, Nuevo Leon, Mex. Capitalization was increased in 1903 to \$8,000,000, Mexican. Has an extensive smelting plant, and does a large custom business on silver, lead and copper ores. Production in 1903 was 215,568 lbs. refined copper.

MONTE RUBIO GROUP.**SPAIN.**

Mine office: Paimogo, Huelva, Spain. Under lease to United Alkali Co. C. & J. Sundheim, owners; Wm. Guthrie Bowie, manager. Lands, 100 hectares, including Monte Rubio, Gibraltar and Atbalcal Arbalcal mines. Properties show extensive remains of Roman and modern workings to the water-level, showing numerous masses of ferruginous gangue impregnated with copper oxides, sulphides, sulphates and carbonates. Lessees said to plan building a 22-kilometre railway to Coiña Veral.

MONTEZUMA COPPER CO.

Office: Albuquerque, N. M. Incorporated 1902, with capitalization \$500,000, shares \$1 par, by Geo. Crocker, Chas. Hall Wheeler and Morris P. Brewer. Location of lands, if any, unknown.

MONTEZUMA LEAD CO.**MEXICO.**

Mine office: Santa Barbara, Parral, Chihuahua, Mex. A lead and zinc mine, carrying incidental values in gold and silver, with 0.5% to 1% copper. Production is about 120,000 tons of ore yearly.

MONTEZUMA MINING CO.**WASHINGTON.**

Lands, 6 claims, 9 miles from Fairfax, Wash. Ore occurs as slightly auriferous chalcopyrite, in a fissure vein traversing diorite.

**MONTEZUMA AND THE WHIZZERS
GOLD-COPPER MINE.****SOUTH DAKOTA.**

Office and mine: Deadwood, Lawrence Co., S. D. Employs 28 men. Owned by J. T. Gillmore, manager, and the C. W. Carpenter estate. Lands, 13 claims, patented, area 135 acres, in the Whitewood district, showing a prominent gossan capping with several cupriferous veins, of which one has an estimated average width of 45', and has been traced 3,000'. Has been worked for gold, to nearly the water level. Owners plan sinking a 500' two-compartment working shaft. Has produced considerable low-grade fluxing ore, sent to the Golden Reward smelter, at Deadwood.

MONTGOMERY GOLD LEAF MINING CO.**NEW JERSEY.**

Office: Belvidere, N. J. H. G. Deshler, secretary and treasurer. Lands, mineral rights to 1,028 acres, in Pahaquarry Twp., Warren Co., N. J., formerly worked as a copper mine and showing low-grade ore in old workings.

MONTPELIER COPPER MINING & SMELTING CO.**IDAHO.**

Mine office: Montpelier, Bear Lake Co., Idaho. Fredk. W. Rose, superintendent. Property includes the Duke, Emerald and other mines, carrying argentiferous copper ore. Idle at last accounts.

**MONTREAL & BOSTON CONSOLIDATED
MINING & SMELTING CO., LTD.****BRITISH COLUMBIA.**

Office: Canada Life Bldg., Montreal, Canada. Mine office: Greenwood, B. C. Organized April, 1904, under laws of Ontario, with capitalization \$7,500,000, shares \$5 par, as successor of the Montreal & Boston Copper Co., Ltd., Dominion Copper Co., Ltd., Morrison Mines, Ltd., Athelstan-Jackpot Gold Mining Co., Brooklyn-Stemwinder and Rawhide mines. Col. George Pope, president; Archibald G. Loomis, secretary and treasurer; H. T. Pemberton, general manager; J. C. Welsh, smelter superintendent; Geo. H. Collins, mine superintendent.

Lands are very extensive, nearly surrounding the properties of the Granby, also a 32-acre smelter site, an 80-acre townsite and a water-power at Boundary Falls. Lands of the Montreal & Boston Copper Co., Ltd., included the Sunset and Crown Silver, on which the principal development has been secured, also the Jewel, Ruby, King Solomon, Morrison No. 7, C. O. D., and Florence fraction. These lands show 4 lenses of low-grade sulphide ores containing large percentages of iron, lime and silica, rendering the ores self-fluxing, these returning about 23 lbs. of copper and \$1 or better in gold and silver per ton.

The Sunset has a 412' main shaft and the Crown Silver has a 265' main shaft. There also is an 880' tunnel, with total underground openings of about two miles, but the bulk of the ore is won open-cast, in a large quarry. A trestle runs from the Sunset shaft to a 2,000-ton ore bin on the railroad siding, whence ore is shipped to the smelter. The mine has a good power equipment, including a 100-h. p. 14x20" duplex link-motion Jenckes hoist, an 80-h. p. 14x20" double-cylinder Lidgerwood hoist, half of a 20-drill duplex Ingersoll-Sergeant air-compressor and two 80-h. p. boilers. Surface buildings include a machine shop, smithy, assay office, boarding house and bunk-houses.

The Morrison mines have an area of 65 acres, crown-granted, showing lenses of ore in altered limestone carrying auriferous and slightly argentiferous chalcopyrite, opened by shafts of 55' and 230', with 4,300' of tunnels, estimated to show 200,000 tons of ore, with 110,000 tons blocked out for stoping. Property is capable of shipping 150 tons daily during 1905. Average smelter returns are 0.6% copper, 0.5 oz. to 1 oz. silver and 0.2 oz. gold per ton, average ore value being about \$4 per ton. Has a 110-h. p. steam plant with 7x9" hoist, 5-drill Rand air compressor and necessary surface buildings. Canadian Pacific railroad is $1\frac{1}{4}$ miles distant.

The Athelstan-Jackpot is worked open-cast, with about 100,000 tons of ore in sight, ore running 0.6 oz. silver and up to 0.8 oz. gold per ton, averaging about \$7.50 per ton in value.

Lands formerly held by the Dominion Copper Co., Ltd. include the Brooklyn, Stemwinder, Rawhide, Standard, Idaho and Montezuma claims. The Brooklyn-Stemwinder group, area 170 acres, has about 350,000 tons of ore in sight, which will average about 2% copper, 0.3 oz. silver and 0.1 oz. gold, with an average value of \$5.62 per ton. The Brooklyn-Stemwinder has been given new machinery of 600 tons daily capacity, and was producing about 400 tons daily at the close of 1904. The Rawhide mine has a blanket vein showing 5 acres of low-grade auriferous sulphide ore, 80' thick, which can be mined cheaply by steam-shovels. The property should produce about 300 tons daily in 1905.

The Mountain Rose mine, at Summit, B. C., has much the same ore as the Sunset, valuable chiefly for fluxing, owing to the large excess of iron, the ore carrying only small values in copper, silver and gold. The ore bodies are large, and the property is worked open-cast. The company also owns a three-fourths interest in the Emma mine.

The smelter, at Boundary Falls, 4 miles from the mine, is connected therewith by the Canadian Pacific railway. The smelter is 120x182' on the ground and 78' high, built by the Standard Pyritic Smelting Co., but never operated until bought by present owners, June, 1901. There are three furnaces, 40x176" at the tuyeres, nominally of 300 tons and actually of about 400 tons daily capacity, with crushers, rolls, Vezin and Bridgman automatic samplers, belt conveyors, No. 7 Connorsville blowers and a 250-light dynamo. Smelter has 16 ore bins, each 10x34', in the building, with 3 large ore bins and coke bins outside, having railroad tracks running above. The stone and brick dust-flue is 200' long, leading to a stack 112' high and 9'6" in diameter. The installation of a fourth furnace and a converter plant is contemplated. Slag formerly was granulated, but now is dumped molten, the smelter having a 40" slag-line with 7x12" locomotive. Product of the smelter is a matte of 45% tenor, to be converted at the Granby smelter. The smelter was blown in late in 1904, after nearly a year's idleness. Production in 1903 was 2,551,142 lbs. refined copper, 58,728 oz. silver and 7,705 oz. gold. In 1904 the smelter treated about 40,000 tons of ore, producing 1,125 tons of matte, containing approximately 920,000 lbs. copper, 13,494 oz. silver and 3,435 oz. gold. At beginning of 1905, property was

producing about 600,000 lbs. of copper monthly, from 2 furnaces. It is planned to install a fourth furnace, which would permit a monthly output of approximately 1,200,000 lbs. Monthly mining and smelting costs are put at \$3.05 per ton.

The Montreal & Boston is a very large and very low-grade property, but with adequate capital and careful management should make a large and profitable producer.

MONTREAL GROUP.**UTAH.**

Held by the Royal Gold & Copper Co., at last accounts.

MONTT HERMANOS.**CHILE.**

Mine office: San Juan, Freirina, Atacama, Chile. Principal properties are the Quebradita, 300' deep, opened 1834; Rosario, 290' deep, opened in 1854; Manto, 160' deep, opened in 1846, and San José, 180' deep, opened in 1851.

MONUMENT COPPER MINING CO.**MONTANA.**

Organized August, 1902, by Alex. S. Christie et al., of Butte, Mont., with capitalization \$75,000. Lands are on Bloody Dick Creek, 30 miles from Red Rock, Beaverhead Co., Mont.

MOON GOLD MINING CO.**CALIFORNIA.**

Office: Valley Springs, Cal. Mine office: Richey, Amador Co., Cal. J. B. Lucas, vice-president and general manager. Has two shafts, of 100' and 140'. Vein-stuff is a sulphide mineralization of diabase and talcose schist, carrying gold and copper values.

MOON-ANCHOR COPPER MINING CO.**WYOMING.**

Office and mine: Encampment, Carbon Co., Wyo. Organized 1901 under laws of Wyoming, with capitalization \$1,000,000, shares \$1 par. L. W. Tennant, president and general manager; W. J. Wernli, secretary and treasurer. Lands, 3 claims, area 60 acres, in the Upper Platte district, said to show a 50' fissure vein of sulphide ore giving assays up to 10% copper, developed by a 200' shaft. Property has a steam plant and is regarded as promising.

MOONMERA COPPER MINING CO., LTD.**AUSTRALIA.**

Offices: 69, Queen St., Brisbane, Australia. Mine office: Moonmera, via Rockhampton, Queensland, Australia. T. G. Dewar, secretary; Samuel Phillips, general manager. Lands, 4 leases, area 200 acres, showing 4 ore bodies, 2 of which are partly developed. Country rocks are sandstone and granite, veins having an arenaceous gangue. Gold is found in the oxidized zone, but values turn to copper at a little depth. Ores are mainly sulphide, with a little oxidized ore and some native copper, sometimes as flakes and small sheets, but commonly disseminated in small particles. The property also shows large bodies of low-grade carbonate ores. The ores average 1.75% to 2% copper, and by rejecting about 70% of the ground broken, can furnish 5% ore to the mill, which should concentrate to about 17.5% copper and 9 dwts. gold per ton. The mine is opened by shafts of 50' and 93' and by 5 tunnels, of 90' to 280' length.

MOONTA CENTRAL COPPER CO., LTD.**AUSTRALIA.**

Offices: 30, Moorgate St., London, E. C., England, and Adelaide, South Australia. Mine office: Wallaroo, Yorke Peninsula, South Australia. A. Lesser, chairman; John Alex. Russell, secretary; John S. Scott, manager. Organized Oct. 29, 1901, as a reorganization of the Mid-Moonta Copper Mines, Ltd., with capitalization £110,000, shares £1 par, in 50,000 6% cumulative preference shares and 60,000 ordinary shares. Debentures, issued, £1,400 at 10%. Lands, 152 acres, held under 99-year lease, expiring 1991, from the South Australian government. Has steam power and concentrator, employing about 75 men. Has 4 shafts, deepest 432', said to show considerable medium-grade ore.

SOCIEDAD MINERA DEL MORADO.**CHILE.**

Owns the Arenillas mine, opened 1860, in the department of Freirina, Atacama, Chile. Has a small matting furnace. Idle at last accounts.

FRANCISCO MORAN.**MEXICO.**

Office and mine: Mineral de Asientos, Aguascalientes, Mexico.

MORENCI COPPER CO.**ARIZONA.**

Office 44 Broadway, New York. Mine office: Morenci, Graham Co., Ariz. Stephen Panish, president; Geo. M. Penny, secretary. Originally known as the Arizona Gold Mining & Milling Co.; reorganized as Gold Cliff Mining & Milling Co.; re-reorganized as Morenci Copper Co. Lands, sundry claims in the Morenci district, with a 150' shaft, showing 6% copper ore, on the Micawber group. Moribund.

MORENCI COPPER MINES, LTD.**ARIZONA.**

Merged, 1903, into Clifton Consolidated Copper Mines of Arizona, Ltd.

MORGERNSTERNWERK.**GERMANY.**

Mine office: Kupferberg, Schlesien, Germany. Employs 250 men.

MORMON GIRL MINING CO.**ARIZONA.**

Office: care of Western Trust & Guaranty Co., New York Life Bldg., Chicago, Ill. Mine office: Cave Creek, Maricopa Co., Ariz. Organized Aug. 26, 1903, under laws of Arizona, with capitalization \$500,000, shares \$1 per. M. D. Shipman, president; Henry D. Spencer, vice-president; Davis Ewing, secretary; A. W. Fisk, treasurer; Chas. Davies, superintendent. Lands, 4 claims, area 80 acres, also 5-acre millsite, in the Cave Creek district, showing two 4' contact veins, between granite and slate, and diorite and slate, giving average assays of 6% to 8% copper, 4 oz. to 15 oz. silver and \$4 to \$50 gold per ton, from silicates and silicious oxides and carbonates, opened by a 225' shaft and a 400' tunnel. Has steam power, carpenter shop, machine shop, smithy, boarding-house, and a 25-ton mill, with 5 stamps and a 10-ton Huntington mill set tandem, also a 25-ton leaching and cyanide plant. Ores are said to give average returns of about \$20 per ton, and after crushing and amalgamation of gold on the plates, tailings are first leached for copper and afterward cyanided for gold. Copper precipitates are shipped to custom smelters. Apparently idle.

MORNING STAR MINE.**CALIFORNIA.**

An old and idle mine, in the Mogul district, north of Markleeville, Alpine

county, California, showing ores assaying as high as 17% copper, 49 oz. silver and \$32 gold per ton.

MORNING STAR MINING CO.**ARIZONA.**

Letter returned unclaimed from former mine office, Dewey, Yavapai Co., Ariz.

MORONG MINE.**VIRGINIA.**

An old property near Virgilina, Halifax county, Virginia.

MORRISON MINES, LTD.**BRITISH COLUMBIA.**

Absorbed, 1904, by Montreal & Boston Consolidated M. & S. Co.

MOTHERLODE COPPER MINING CO.**VIRGINIA.**

Mine office: Virgilina, Halifax Co., Va.

MOUNT AETNA GOLD & COPPER MINING CO.**UTAH.**

Supposed to have property somewhere in Utah. J. A. Kauffman, superintendent, at last accounts. Presumably idle.

MOUNT ANDREWS MINE.**ALASKA.**

Mine office: Coppermount, Prince of Wales Island, Alaska. Title has been in dispute, but by recent ruling of the general land office seems vested in Samuel Lichtenstadter, of New York, who is supposed to represent a Scotch syndicate.

MOUNT BABINDA MINE.**AUSTRALIA.**

A Queensland property that in 1902 produced a little ore, dressed up by hand-cobbing to 23% copper and 20 oz. silver per ton, with small gold values.

MOUNT BAKER & SHUKSHAN MINING CO.**WASHINGTON.**

Office: 35 Hinkley Blk., Seattle, Wash. Mine office: Shukshan, Whatcom Co., Wash. J. Conaway, president; C. M. Walsh, secretary; Geo. B. Conaway, superintendent. Has copper-gold ores, opened by 320' tunnel, and plans improving an available water power and erecting a reduction plant. Employs 10 men.

MOUNT BULGA COPPER CO.**AUSTRALIA.**

A partially developed property in the Orange division of New South Wales, Australia.

MOUNT CHALMERS COPPER MINES, LTD.**AUSTRALIA.**

Voluntarily wound up, May 1, 1901.

SOCIETE DES MINES DE CUIVRE DE**AUSTRALIA.****MONT CHALMERS.**

Company wound up, 1901.

MOUNT DIAMOND COPPER CORPORATION, LTD.**AUSTRALIA.**

Offices: 18, Broad St. Ave., London, E. C., Eng. E. Fewings, chairman; L. G. Brown, secretary. Lands, 240 acres, leasehold, 5 miles northeast of Wandie goldfields, South Australia. Idle and apparently moribund.

MOUNT DONALDSON COPPER CO., LTD.**TASMANIA.**

Offices: 38, Gracechurch St., London, E. C., Eng. Col. H. J. Byrne, chairman; D. B. Cotton, secretary. Organized March 28, 1899, with capitalization £150,000, shares £1 par. Lands, 159 acres, on Mt. Donaldson, Corinna, Tasmania. Idle for several years.

MOUNT EDDY MINING & DEVELOPMENT CO. CALIFORNIA.

Letters returned from former office, San Francisco, Cal. Lands were 14 claims, near Sisson, Siskiyou county, California.

MOUNT FISHER PROPRIETARY CO. AUSTRALIA.

Planned building a smelter at last accounts. Probably idle.

MOUNT FLORA MINE. AUSTRALIA.

Mine office: Mackay, Queensland, Australia. Made 17 tons of copper in 1901. Idle at last accounts.

MOUNT FRASER COPPER MINES, LTD. AUSTRALIA.

Company voluntarily wound up.

MOUNT GARNET & CHILLAGOE EXPLORATION. AUSTRALIA.

Offices: 47, Queen St., Melbourne, Australia. Colin Templeton, chairman; John Brandon, secretary. Capitalization £25,000, shares £10 par, £5 5s. paid in. Lands, 4 leases, area 363 acres, near Mt. Garnet, northern Queensland, Australia, on which development has shown a large body of low-grade copper ore, estimated to have 100,000 tons of ore in sight. Idle.

MOUNT GARNET FREEHOLD COPPER & AUSTRALIA.

SILVER MINING CO., LTD.

In liquidation.

MOUNT GARNET RAILWAY & FREEHOLD MINES. AUSTRALIA.

An ineffective attempt at reorganizing the Mt. Garnet Freehold Copper & Silver Mining Co., Ltd.

MOUNT GODDARD COPPER MINING CO.

Office: Fresno, Cal. No recent returns. Probably moribund.

MOUNT HOPE MINE. AUSTRALIA.

Owned by New Mount Hope Copper Mining Co., Ltd.

MOUNT JUKES PROPRIETARY MINING CO. TASMANIA.

Office: care of T. L. Hood, agent, Hobart, Tasmania. Lands, sundry claims in the Mt. Jukes field, partially prospected.

MOUNT LYELL BLOCKS COPPER CORPORATION, LTD. TASMANIA.

Reorganized, 1903, as Mt. Lyell Blocks Mining Co.

MOUNT LYELL BLOCKS MINING CO. TASMANIA.

Offices: Finsbury House, London, E. C., Eng., and 47, Queen St., Melbourne, Australia. Employs 77 men. Organized March 20, 1903, under laws of Victoria, as reorganization of the Mt. Lyell Block, Copper Corporation, Ltd., with capitalization £300,000, shares £1 par; fully issued and 19s. 3d. paid in. F. G. Duff, chairman; C. E. Nicholas, mine manager; E. Habben, secretary in London; Thos. Rollason, secretary in Melbourne. Lands, 317 acres, including millsite and timber lands, also right for 7 years to mine on adjoining lands of the Mt. Lyell Consols, on royalty of 40% of net profits. Principal ore bodies are low-grade sulphides and native copper, occurring in argillaceous schists. The native copper is claimed to average 3% which probably is a serious over-estimate, and can be concentrated by simple puddling to 40% in tenor. This ore body has been proven to a depth of 420' and is mined at a cost of about 13s. per ton.

Ground is very soft, turning to clay when weathered, and is exceedingly

treacherous, requiring heavy timbering and constant watchfulness. A 350-ton concentrator started work August, 1904, first results being very unsatisfactory but better work is hoped for later. If Lake Superior mines can extract native copper from refractory trap and conglomerate rock, hoisted for nearly a mile, and earn money on 1% returns, the Mt. Lyell Blocks certainly should be able to puddle native copper from clay at a profit, where the copper contents are 50% to 100% greater, and rock is extracted by tunnels.

MOUNT LYELL-COMSTOCK COPPER CO., LTD.

TASMANIA.

Title changed, 1903, to Lyell Comstock Consolidated Copper Co., Ltd.

MOUNT LYELL CONSOLS. (NO LIABILITY).

TASMANIA.

Offices: Equitable Bldgs., Collins St., Melbourne, Australia. J. P. Lonergan, chairman; N. Madden, secretary; H. S. Muir, mine manager; D. J. Mackay & Co., 138, Leadenhall St., London, E. C., Eng., British agents. Capitalization, £128,000. Lands, 50 acres on Mt. Lyell and 40 acres on Mt. Darwin. Latter tract has been prospected, and former is under 7-year lease to Mt. Lyell Blocks Mining Co. on royalty of 40% of net profits secured.

MOUNT LYELL COPPER ESTATES, LTD.

TASMANIA.

Offices: 85, Gracechurch St., London, E. C., Eng. Mylius Cohen, chairman; F. W. Eccardt, secretary. Organized July 19, 1899, with capitalization £150,000, shares £1 par; issued, £103,435. Lands, 4 leases on Mt. Lyell, have been abandoned. Liquidation probable.

MOUNT LYELL EXTENDED CO.

TASMANIA.

Offices: 138, Leadenhall St., London, E. C., England, and Equitable Bldgs., Collins St., Melbourne, Australia. J. P. Lonergan, chairman; M. Gillmore, mine manager; J. P. Madden, secretary in Melbourne; H. M. Taylor, secretary in London. Capitalization, £150,000. Lands, 30 acres on Mt. Lyell and 80 acres on Mt. Darwin. Idle.

MOUNT LYELL MINING & RAILWAY CO., LTD.

TASMANIA.

Offices: Finsbury House, London, E. C., England, and 39 Queen St., Melbourne, Australia. Mine and smelter office: Queenstown, Montague Co., Tasmania. Employs about 2,000 men, of whom about two-thirds are in the reduction works. Organized 1893, under laws of Victoria, and reorganized Aug 11, 1903, with capitalization £1,300,000, shares £1 par; issued, £1,200,000. Debentures, £97,750, at 5%. Has absorbed the North Mt. Lyell, South Tharsis, Royal Tharsis, King Lyell, North Crown Lyell Block, Central Lyell Block, West Lyell Extended and Prince Lyell mining companies, at various times. Has paid dividends of £1,060,635, 19s. 3d., to close of 1904. Bowes Kelly, chairman; Wm. Knox, M. P., vice-chairman; Robt. C. Sticht, general manager; W. P. Batchelor, chief engineer; Alfred Mellor, secretary in Melbourne; Edwin Habben, secretary in London; Hon. B. Stafford Bird, agent, Hobart, Tasmania; E. Carus Driffeld, superintending engineer of railway; H. Single, assistant railroad engineer; W. A. Beamish, assistant mine engineer; Geo. W. Wright, assistant engineer; A. Lewis Dean, metallurgist; W. H. Wesley, assistant metallurgist; A. N. Macnicol, mechanical engineer; P. E. Kaepel and H. E. Bannister, accountants.

Lands, 2,976 acres, in 50 leases, mostly held from the crown for terms of 30 years, also 300 acres of railway lands and a 500-acre smelter-site. Mining lands are in the Mt. Lyell district of Montague county, on the west coast of Tasmania. Property was worked in a small way as a gold mine, until taken over by the present company, which began production in 1896. The Mt. Lyell property has six principal lenticular ore bodies, largest being the Mt. Lyell, with greatest width 270', extreme length 660' and depth 730'. This lense has a conglomerate foot-wall and schistose hanging-wall, carrying sulphide ores, chiefly cupriferous iron pyrites, with occasional chalcopryrite, bornite, chalcocite, tetrahedrite and native copper, giving average returns of 2.35% copper, 2 oz. silver and 0.0725 oz. gold per long ton. The low grade reserves of the Mt. Lyell ore body average 0.65% copper, 1.6 oz. silver and 0.06 oz. gold per long ton. The North Lyell gives returns of 6% to 12% copper and carries 15% to 20% alumina and 60% to 75% silica, giving an ore exceedingly refractory in furnace unless fluxed with basic ores, such as are furnished by the Mt. Lyell proper. The auxiliary mines give ores averaging 2.25% copper, 0.5 oz. silver and 0.25 oz. gold per long ton. An average analysis of the Mt. Lyell smelting ores gives 2.35% copper, 40.30% iron, 2.04% alumina, 46.50% sulphur, 4.42% silica and 2.50% barium sulphate.

Mining is done open-cast, in terraces, at the Mt. Lyell and at the principal auxiliary mines, underground extraction being subsidiary and confined to the removal of the richer patches of ground encountered during exploitation of the ore bodies. A traveling crane at the open-cast workings assists in the removal of ore. Underground workings are about 4 miles in the Mt. Lyell, and 2 miles in subsidiary mines, exclusive of the North Lyell, developing about 5,000,000 long tons of ore in the Mt. Lyell and 300,000 long tons of ore in the other mines, exclusive of the North Lyell. Workings include 25 tunnels, from 40' to 1,150' in length, with aggregate length of about 7,000', the mine having a total of about 40,000' of underground openings. The Mt. Lyell has a 100' surface shaft and a 168' blind shaft and 260' of winzes, and the auxiliary mines have one 148' surface shaft and numerous winzes. The overburden of the Mt. Lyell main ore body is estimated at 1,500,000 cubic yards, all of which must be stripped eventually. The mine is lighted by electricity and 2 diamond drills are used steadily in probing the ground. The North Lyell ores are much richer and show considerable ore remaining that averages better than 10% copper. The North Lyell furnishes about 25% of the total ore production. The property is very valuable, and the ore is the richest in Tasmania, but is refractory in smelting, unless blended with the basic ores of the Mt. Lyell. In addition to the ore mines there are extensive silica and limestone quarries, with a crushing plant near the reduction works.

The North Lyell has a 50x284' concentrator of 120 tons daily capacity, and there is another small concentrator, not in present use, that was acquired by the purchase of an adjoining mine.

The smelting plant is at Queenstown, on the Queen river, $1\frac{1}{4}$ miles from the mines, receiving ore by narrow-gauge railroad, aerial tramway and counterbalance inclines surmounting the intervening hills, the aerial tramway being of 1,500 long tons daily capacity. The smelter is in two separate sections. Smelter No. 1 has 5 water-jacket blast furnaces $40 \times 168''$ at the tuyeres, and one $36 \times 126''$ blast furnace. No. 2 smelter has six $42 \times 127''$ water-jacket blast furnaces, the latter being 20' in height, over all. All furnaces have cast-iron water-jackets. The capacity of the large furnaces in No. 2 plant is about 350 tons daily, treating an average of about 275 tons daily, and No. 6 furnace in No. 2 smelter holds the world's record, having treated a total charge of 724 tons of matte, slag, limestone and silica in a single day. The furnaces use a 3-lb. blast supplied by nine No. 8 Root blowers and three No. 7 Root blowers, each driven by a $12 \times 22 \times 18''$ direct-connected compound condensing vertical engine. Blast is heated by 8 hot-blast stoves of the hanging U-pipe type. Pyritic smelting is employed exclusively, using no coke on ore in the blast furnaces, and with a minimum use of coke when concentrating 15% first-fusion matte to matte of about 45% to 50% in tenor for the converters, the consumption of coke averaging only 1% for entire metal-bearing material treated. The 75-ton converter plant has two remelting furnaces, 6 stands and 14 shells, with two $16 \times 24 \times 30''$ compound condensing air compressors. Product is blister copper averaging 98.83% copper, 100 oz. silver and 3.21 oz. gold per long ton, shipped, under contract expiring 1905, to the Baltimore Copper Smelting & Rolling Co., of Baltimore, Md., U. S. A., for electrolytic refining. The smelting plant also treats custom ores. The power plant at the smelter has twelve 125-h. p. Babcock & Wilcox boilers and 16 multitubular boilers, giving a total of 3,000-h. p., with a Green fuel economizer, induced draft, and superheaters, the joint use of which effects a saving of 31% in fuel charges.

The 250-ton North Lyell smelter, 28 miles from the mine, is $75 \times 210'$ in size, with four $16 \times 32'$ reverberatory furnaces, 4 blast furnaces and a converter plant. The North Lyell works also have a $69 \times 72'$ sampling mill, $41 \times 66'$ boiler-house with three 250-h. p. Stirling water-tube boilers, and a $60 \times 100'$ power house with 200-kw. generators and cross-compound blowers. This plant is idle. A little cement copper is secured by leaching the mine water.

The mine has steam and electric power, with a partly-developed water power. Cordwood is used for fuel, consumption averaging about 1,200 cords weekly. Electric power is transmitted to the outlying plants and there also is a complete electric lighting system. The mining plant includes 6 underground hoists and 38 power drills. The company owns a coking plant at Port Kembla, New South Wales, this having 62 funnel-shaped ovens, doing a general commercial business in addition to supplying the company's requirements.

The company has two private railroad systems of 31 and 38 miles, respectively, also a 24"-gauge line with 6 locomotives, connecting the mines, flux quarries, smelters, warehouses and yards. The 31-mile line of 42"

gauge runs from the smelter at Queenstown to the seaport of Strahan, with extensive wharves on Macquarie Harbor, connecting at the latter point with the Strahan-Zeehan government line, giving rail connections with all parts of the colony. The Queenstown-Strahan line traverses an exceedingly difficult country, $4\frac{1}{2}$ miles of this line having gradients of 1 in 20 and 1 in 16, employing 4 special Abt type locomotives and centre-rack railway in addition to ordinary adhesion engines. The company's private lines have 238 cars. Miscellaneous enterprises include a complete machine shop, iron and brass foundry, brickyard and sawmill.

Production was 17,111,360 lbs. fine copper in 1902; 14,798,585 lbs. in 1903, and 18,462,080 lbs. copper in 1904, the by-products for 1904 being 813,130 oz. silver and 23,446 oz. gold. The ore reserves of the mine are estimated at about 1,600,000 tons. For the year 1903, costs were 3s. 6d. per long ton for mining at the Mt. Lyell, and 11s. 6d. for mining at the North Mt. Lyell, and 9s. 3d. for smelting and converting. In the fiscal year ended Sept. 30, 1904, mining and reduction costs were lowered to an average of 13s. 7d. per ton, for the entire property, in consequence of which an increased profit was secured, notwithstanding the lower average grade of ore won, in addition to which the smelter showed a closer extraction of values. The Mt. Lyell has not been an easy property to handle, presenting a succession of serious mining and metallurgical problems. Impossible as these have appeared at first, they have been overcome one by one, and the high regard in which Mr. Sticht is held by the mining world has been amply earned by his highly successful work under great difficulties. His efficient staff also is entitled to much credit in this connection.

MOUNT LYELL NORTH CO.

TASMANIA.

Offices: 153, Leadenhall St., London, E. C., Eng. Moribund.

MOUNT LYELL PROPRIETARY MINES, LTD.

TASMANIA.

Voluntarily wound up, June, 1901.

MOUNT LYELL SOUTH CO.

TASMANIA.

Offices: 153, Leadenhall St., London, E. C., Eng. A Siamese twin of the Mt. Lyell North. Apparently moribund also.

**MOUNT LYELL TASMAN COMSTOCK GOLD, SILVER,
LEAD & COPPER MINING CO., LTD.**

TASMANIA.

Offices: Launceston, Tasmania. Mine office: Mt. Lyell, Montague Co., Tasmania. C. H. F. Shern, agent; F. H. Mitchell, mine manager. Employed about 25 men in prospecting at last accounts.

COPPER MINES OF MOUNT LYELL WEST, LTD.

TASMANIA.

Offices: 16, St. Helen's Pl., London, E. C., Eng. Mine office: Gormans-ton, Montague Co., Tasmania. Chas. McCulloch, chairman; A. G. Ogilvie, mine manager; Herbert A. H. Russell, secretary. Organized Oct. 7, 1897, under laws of Tasmania, with capitalization £400,000; issued, £230,000, Lands, 8 leases, area 70 acres, adjoining the Mt. Lyell Mining & Railway Co., showing several wide ore bodies, assaying 3% to 7% copper, with small gold and silver values. Development is by 2 tunnels. Idle since June, 1901.

MOUNT MOLLOY MINE.**AUSTRALIA.**

A property in the Herberton district of Queensland, Australia, that has been worked intermittently in a small way for some years. Produced about 1,200 tons of high-grade ore averaging 20% to 25% copper in 1902.

MOUNT MORGAN COPPER CO.**AUSTRALIA.**

Reorganized as Moonmerna Copper Mining Co., Ltd.

MOUNT MORGAN GOLD MINING CO., LTD.**AUSTRALIA.**

Offices: 9, Gracechurch St., London, E. C., Eng. and 118, Pitt St., Sydney, Australia. Mine office: Rockhampton, Queensland, Australia. Organized Oct. 1, 1886, under laws of Queensland, with capitalization £1,000,000, shares £1 par. R. S. Archer, Australian chairman; W. K. D'Arcy, London chairman; J. Jenkins, London secretary; H. Woodd, Australian secretary; Capt. G. A. Richard, general manager; H. P. Seale, mine manager. Lands, 640 acres freehold, 90 acres perpetual leasehold and 480 acres leasehold. Has been a large and regular dividend-payer for 20 years. Production is mainly gold, to annual value of about \$2,000,000, but a little copper is secured as a by-product, and lower levels of mine show increasing copper values, while diamond drill borings during past 18 months have proven existence of large quantities of auriferous copper ores, proper treatment of which will require additional works, adapted to copper reduction. Property seems likely to become one of the most important Queensland copper producers within the next few years, as company is strong financially, and in its management.

MOUNT PERRY COPPER MINING CO.**AUSTRALIA.**

A London company by this title is said to have reopened the Mount Perry, mine, in Queensland, Australia, but no trace of company has been secured in London.

MOUNT PERRY COPPER & REID'S CREEK**AUSTRALIA.****GOLD MINES & SMELTING CO., LTD.**

Voluntarily wound up, June, 1902.

MOUNT PITTON MINE.**AUSTRALIA.**

Mine office: Mt. Pitton, South Australia. T. W. Styles, manager. Has steam power and employed about 25 men at last accounts.

MOUNT PLEASANT MINE.**AUSTRALIA.**

Mine office: Cobar, Robinson Co., N. S. W., Australia. Is a small producer, working pockets of chalcocite, chalcopyrite and carbonates, ores being sent to the Cobar plant for smelting.

MOUNT READ MINING CO., LTD.**TASMANIA.**

Offices: Worcester House, Walbrook, London, E. C., England, and Cook's Chambers, Elizabeth St., Hobart, Tasmania. H. J. Campion, chairman; M. M. Ogle, secretary in London; J. Hickson, secretary in Tasmania. Capitalization, £150,000. Lands, 80 acres, carrying gold, silver, lead and zinc, with about 0.5% copper, also 121 acres carrying water-rights for mill and smelter sites.

MOUNT ROSE MINE.**AUSTRALIA.**

Mine office: Wallaroo, South Australia. J. Renfrey, manager. Has steam power and employed 25 men at last accounts.

MOUNT ST. HELEN'S CONSOLIDATED MINING CO. WASHINGTON.

Office: Marquam Bldg., Portland, Ore. Mines are at Spirit Lake, via Castle Rock, in the St. Helen's district of Skamania county, Washington, 50 miles from Portland. Employs about 25 men. Organized 1902, under laws of Oregon, with capitalization \$1,800,000, shares \$1 par. Hugh McGuire, president; Chas. A. Marsh, secretary; Dr. Henry Waldo Coe, treasurer; Robert A. Foster, general manager; Andrew Olson, superintendent. Lands, 35 claims, area 600 acres, also a 40-acre millsite, property including former holdings of the Sweden, Cascade, Calumet and Bronze Monarch mining companies, also the Index mine, 2½ miles from the main group, said to show a 44' vein carrying 1.5% copper, and good values, about equally divided, in gold and silver, with average gross values in the three metals of \$14.50 per ton.

The main group shows 8 fissure veins, with more or less work done on 5. The ore is sulphide, occurring in 12" to 12' pay-streaks in a mineralized zone of low-grade ore several hundred feet in width, the pay-streaks assaying about 9% copper, 40 oz. silver and \$8 gold per ton, with occasional lead. Development is mainly by tunnels, longest 350', 420' and 2,000', with sundry open-cuts and trenches. Equipment includes an 80-h. p. Pelton water wheel, air-compressor, power drills, sawmill, etc., and company plans building a 50 or 100-ton concentrator, as low-grade ores are said to have shown a concentration of 18 into 1. Nearest railway 40 miles, but surveys for three lines have been made into the district. Management considered good and property promising.

MOUNT SHASTA GOLD MINES CORPORATION. CALIFORNIA.

An unsavory concern, succeeded, 1904, by Phoenix Gold Mining Co.

MOUNTS SICKER & BRENTON MINES, LTD. BRITISH COLUMBIA.

Mine office: Mt. Sicker, Vancouver Island, B. C. Lands are the Copper Canyon group of 5 claims on Mt. Sicker, also 4 claims on Mt. Brenton, with total area of about 160 acres, carrying the continuation of schistose ore formation of the Tyee and Lenora mines. Has done considerable development work on various claims, but has not secured a workable ore body as yet.

MOUNT STERLING MINE. CALIFORNIA.

Owned by Kneiper & Ashbrook. Lands are in Section 10, T. 12 S., R. 23 E., Fresno county, California.

MOUNT THECKLA MINE. AUSTRALIA.

Absorbed by Kangaroo Hills Mining & Smelting Co.

MOUNT UNION CONSOLIDATED MINING CO. ARIZONA.

Office: Muskegon, Mich. Mine offices: Prescott, Yavapai Co., Ariz., and Safford, Graham Co., Ariz. Organized 1904, under laws of Arizona, as successor of the Michigan-Arizona and Mount Union Mining Companies. R. H. Green, president; Eugene Greenwood, manager; Theodore T. Swift, superintendent. Yavapai county lands, 14 miles south of Prescott, in the Hassayampa district, are opened on 2 veins showing sulphide copper and lead ores carrying gold and silver values, by shafts of 200' and 460'. A small mill was being built at end of 1904. The Graham county lands, 7 claims, opened by

a 2-compartment vertical shaft, show ores carrying 0.25% to 10% copper, in a vein having a heavy gossan capping.

MOUNT WASHINGTON COPPER CO.**MARYLAND.**

Property sold under foreclosure, March, 1903.

MOUNT ZIRKEL COPPER MINING CO.**COLORADO.**

Office: 240 La Salle St., Chicago, Ill. Mine office: Pearl, Larimer Co., Colo. Organized 1901, under laws of Wyoming, with capitalization \$1,000,000, shares \$1 par. Wm. A. McGuire, president; E. B. Boisot, secretary and treasurer; L. D. Godshall, general manager; J. J. Mackey, superintendent. Lands, 7 claims, area 60 acres, also a 5-acre millsite, in the Big Horn district, showing a 75' fissure vein claimed by company to average 20% copper, 4 oz. silver and \$10 gold per ton, which is too good to be true, opened by a 250' shaft. Has steam power. Idle.

MOUNTAIN COPPER CO., LTD.**CALIFORNIA.**

Offices: 3, Lombard St., London, E. C., Eng. Mine office: Keswick, Shasta Co., Cal. Employs about 300 men at the mine and 900 at the smelter and shops. Organized 1896, and reorganized May 10, 1902, with capitalization £1,250,000, shares £5 par; since converted to £1,000,000 of 6% debenture stock and £250,000 returned to shareholders. Wm. Keswick, chairman; A. Frewer, secretary; Lewis T. Wright, general manager; T. J. Jones, mine superintendent; J. A. Black, smelter superintendent; A. S. Haskell, superintendent Martinez plant; J. J. Murray, assistant smelter superintendent; W. Cole, railway superintendent; C. C. Jones, engineer; Vivian Bond & Co., Coffee Exchange Bldg., New York, American agents.

Mine is 10 miles northwest of Redding, near the top of Iron Mountain, and was worked originally in a small way for the gold and silver in the gossan capping. Landed holdings are extensive and in addition to the old mine there is a large sulphide ore body to the north, known as the Hornet, carrying about 6,000,000 tons of low-grade ore that can be handled eventually. The main ore body is a solid pyritic mass, approximately 100' to 400' wide, 800' long and 500' deep, with a gossan capping of 100' to 300'. The ore averages returns of 5% to 5.5% copper, about 2 oz. silver and slightly under \$1 gold per ton, and is mainly chalcopyrite, associated with pyrite and pyrrhotite, occurring in a shear zone in meta-rhyolite. The mine is worked by pillar-and-stall, and depleted stopes are filled with rock quarried just west of the mine. As much ore is left in the pillars, the mine undoubtedly will be robbed eventually, by open-pit work. Ore reserves are estimated at about 500,000 tons and three diamond drills are in steady use on exploratory work. As the ore is strongly pyritic, there has been considerable trouble from mine fires, but every precaution is taken to prevent these and to extinguish such as occur through spontaneous combustion. The Hornet mine ore carries 2% to 2.5% copper, but is rich in sulphur, which runs 47% to 50%. To treat this immense body of low-grade ore, a site was bought December, 1904, at Martinez, Contra Costa county, California, and an extensive plant will be constructed. The business of the San Francisco Chemical Co. has been taken over, and will be made the nucleus of the new plant. The Martinez works

will make sulphuric acid and commercial fertilizers, and after burning for sulphur the cinder will be leached for the copper contents.

The Keswick Smelting Works, 8 miles from the mine, are in the canyon of Spring Creek, less than a mile from the Sacramento river, and have both broad and narrow-gauge railway lines connecting with the Southern Pacific railroad. The smelter has 5 water-jacket blast furnaces of 390 tons daily capacity each, with 11 Wright circular calcining furnaces, 3 stands of converters with 9 Parrott shells, 3 briquetting machines and a complete sampling plant. Ore is heap-roasted in open air, 8 to 10 weeks being required for roasting, the raw ore carrying 45% sulphur and the roasted ore 7%, a steam-shovel handling ores from the roast-heaps. The fines and ores from the roast-heaps are calcined in the Wright turret roasters, and briquetted by three machines, which also handle flue dust and calcined granulated matte, using lime for a binder. The furnaces have settlers, with slag overflow to ladle cars, and a slag railway, the matte pouring into iron casting-moulds on a slow-moving link-belt conveyor, and passing under jets of water to chill the pigs, which are dumped into barrows and hoisted to the charging floor. The first fusion matte is 25% to 30% in tenor, and the second fusion matte is roasted and blown up to white metal, running into settlers and thence to ladles by traveling crane to the converters. The blast furnaces have rotary blowers driven by one Allis-Chalmers cross-compound, one Risdon cross-compound and a small auxiliary straight-line engine, steam being furnished by 3 Babcock & Wilcox boilers and 1 Heine water-tube boiler, all fired with oil. Air from the blowers is heated by stoves fired with oil, before entering the tuyeres, the hot blast effecting great economies and giving a close approach to ideal pyritic smelting, with a very small consumption of coke in the furnaces. The converter plant has an air compressor driven by a 500-h. p. Allis-Chalmers engine, and the 3 stands are controlled hydraulically from a single elevated platform. Linings for the shells are tamped by a power drill, ingeniously fitted with a special tamping-iron bolted into the chuck in place of a drill. Fumes from furnaces, converters and roasters are carried through dust chambers, and flue-dust is briquetted and resmelted. In connection with the smelting plant are large machine shops, a foundry and smithy. Electric power, generated 80 miles distant, is used at a cost of $\frac{3}{4}$ of one cent per h. p.-hour. The smelter also does custom work, buying gold ores of all grades, used for fluxing the company's own ores. The mine and smelter are connected by an 11-mile narrow-gauge electric railway, climbing 2,000' and traversing a difficult country. The company also owns the New Jersey Metal Refining Works, Ltd., at Elizabeth, N. J., which electrolytically refines the blister copper, running 98% to 99% fine. The company also secures considerable cement copper by precipitation from the mine water.

The Mountain Copper Co. fought a combination of mine fires and labor unions for three years, but won both fights, and is no longer subject to the dictation of either the miners' or smeltermen's unions, and run during 1904 with full forces. Production in 1901 was 13,271 tons, falling off to 8,739 tons

in 1902 and 8,534 tons in 1903, and rising to above 10,000 tons in 1904. Net earnings were £143,366. Dividends were suspended during 1902 and 1903. The management is good and the property is of great value.

MOUNTAIN KEY MINE.**NEW MEXICO.**

Office: care of W. C. Chandler, owner and manager, Pinos Altos, Grant Co., N. M. Property is one of the oldest mines in Grant county, having a 700' shaft, and is a producer of auriferous and argentiferous copper sulphides. Has steam power and owner plans installing a small mill and smelter.

MOUNTAIN LAKE MINING CO.**UTAH.**

Office: Salt Lake City, Utah. J. L. Rawlins, president and general manager; E. A. Wedgwood, secretary. Organized 1896, under laws of Utah, with capitalization \$50,000, shares 10c. par. Lands, 24 claims, area circa 400 acres, in the Big Cottonwood district of Salt Lake county, showing 2 contact veins, between diorite and limestone, said to be 100' wide and traceable 2,000', carrying bornite and chalcopryite giving average assay values of 2.5% copper, 2 oz. silver and \$1 gold per ton, opened by a 100' shaft and 5 tunnels, longest 1,100'.

MOUNTAIN VIEW COPPER CO.**OREGON.**

Sold its lands, in the Waldo district, 1903, to Vulcan Copper Co.

MOUNTAIN VIEW DEVELOPMENT CO.**ARIZONA.**

Office: Bisbee, Ariz. Organized 1903, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Geo. Bennett, president; Gano S. Crockett, secretary; I. E. Holmes, treasurer and general manager. Lands, 9 claims, lying 3 miles northwest of Bisbee, showing ore assaying 3% to 50% copper, up to 112 oz. silver and \$4 to \$14 gold per ton, opened by 2 shallow shafts and a tunnel.

MOURGOUL RIVER COPPER CO., LTD.**RUSSIA.**

Offices: 3, Princes St., London, E. C., Eng. E. Fairweather, secretary. Capitalization, £500,000. Was organized to take over sundry copper and silver-lead mines in the Mourgoul division of the Artoin district of the Russian Caucasus, but secretary writes, Feb. 25, 1905, that company had not yet acquired its property.

SOCIETE ANONYME DE MOUZAIA.**ALGERIA.**

Offices: 5, Rue St. Vincent-de-Paul, Paris, Xe., France. Mine office: Campdes Chenes, par Blida, department d'Alger, Algeria. E. Raschlé, president; R. Lava, secretary; M. Duvialard, general manager. Organized 1891, with capitalization 350,000 fr. Lands, 5,362 hectares, showing 6 fissure veins, in schists, carrying chalcopryite, and 10 contact veins carrying antimonial gray copper, veins ranging from 2cm. to 1m. wide and averaging 4% to 5% copper, and from nothing to 27 oz. silver per ton. Mine is opened by a 17m. shaft and 7 tunnels of 39m. to 63m. length, in chalcopryite, and by 12 tunnels, four longest 220m., 240m., 255m. and 265m., in gray copper ore. Mine is served by the West Algerian railroad, 2km. distant. Copper properties have been idle since 1899, but during 1904 the company has developed large bodies of hematite and spathic iron ore, estimated to contain 4,200,000 tons of merchantable grade.

MOZUMI MINE.**JAPAN.**

Owned and operated by the Mitsu Bishi Gossshi Kwaisha.

LOS MUERTOS MINING CO.**MEXICO.**

Mine office: Velardeña, Durango, Mex. Carter Barker, superintendent. Ores carry copper, silver and lead. Has steam power and employs about 100 men.

MULOCK TRACT.**MICHIGAN.**

Office: care of R. P. Mulock, owner, Colfax, Iowa. Lands, 160 acres, being the northwest $\frac{1}{4}$ of Sec. 9, 49-41, near the Norwich mine, Ontonagon county, Michigan. A little exploratory work, done in 1903, under the direction of Chas. Oley, showed 2 cupriferous lodes of 18" to 36" surface width, widening at depth, also other cupriferous lodes of 8' and 10' width.

MULTNOMAH MINING & MILLING CO.**WASHINGTON.**

Mine office. Nespelim, Wash. Was driving a tunnel showing ore carrying good assay values in gold, silver and copper, at last accounts.

MUNGANA (CHILLAGOE) MINING CO., LTD.**AUSTRALIA.**

Offices. 39 Queen St., Melbourne, Australia, and Finsbury House, Blomfield St., London, E. C., Eng. Mine office: Chillagoe, Queensland, Australia. Employs 250 men. V. J. Saddle, chairman; C. L. Hewitt, secretary in Melbourne; E. Habben, secretary in London; E. J. Rodda, mine manager; Fredk. Back, superintendent. Organized March 1, 1901, under laws of Queensland, with capital £125,000, shares 5s par. Lands, 5 leaseholds, area 287 acres, showing ores of copper, silver and lead. Mines are known as the Griffiths, developed by an 80' open-cut; Calumet, opened by an 80' shaft; Magazine, worked open-cast and by an 83' shaft; Dorothy, an old mine, opened by a 100' shaft, Lady Jane, opened by an old 100' shaft and a new 300' three-compartment shaft, and Girofla. Principal operations are at the Lady Jane and Girofla mines. No. 3 shaft on the Girofla has been fully equipped and on the 150' level produces ore giving smelter returns of 18.3% copper. 16.3% lead and 34.5% silver per ton. The Girofla also has a large open-cut, stripped to a depth of 60'. The Lady Jane is proving very wet at a depth of 200'. The old shaft has been lost from a crush, and a third shaft is sinking, and at a depth of 150' was giving some trouble from soft ground above. The water flow is about 200,000 gallons daily.

Production was 414 long tons refined copper in 1902, 720 tons in 1903 and 353 tons in 1904. Production of 1904 was 7,005 tons copper ore and 10,720 tons lead ore, treated at the Chillagoe smelter, making 353 long tons copper, 1904 tons lead and 167,496 oz. silver.

SUCESION JUAN MUÑOZ.**CHILE.**

Office and mine: La Serena, Coquimbo, Chile. Has steam power and a small smelter, employing about 200 men.

MUNROE-THOMPSON ORE REDUCTION CO. NOVA SCOTIA & QUEBEC.

Dead beats, out of business. Fully described in Vol. IV.

MUNSEY GROUP.**MEXICO.**

Mine office: Zacualpan, Mexico, Mex. Geo. W. Small, superintendent.

Lands, 16 pertenencias, area about 40 acres, showing ores of silver, gold and copper. Employed about 20 men at last accounts.

MÜNSTERSCHE GEWERKSCHAFT.**GERMANY.**

Office: Düsseldorf, Germany. Fr. Gessler, manager. Has a mine of iron and copper pyrites, working in a small way at last accounts.

MURRAY MINE.**ONTARIO.**

In the vicinity of Sudbury, Algoma, Ont. Opened 1892, closed 1894. Principal values are in nickel, with some copper. Ore body, said to average 70' wide and low in grade, is a massive pyrrhotite, carrying occasional nickeliferous and cupiferous iron pyrites.

MURRAY-ISABEL MINES CO.**COLORADO.**

Office and mines: care of Murray, Pavey & Seymour, owners, Parkdale, Fremont Co., Colo. E. M. Lamont, superintendent. Ores carry principal values in gold, silver and lead, with a little copper and zinc as by-products. Has steam power and concentrator, shipping concentrated ores direct to smelter. Employs 20 men.

MURRIN COPPER MINES, LTD.**AUSTRALIA.**

Offices: Winchester House, London, E. C., Eng. A. E. Barton, chairman; Chas. Taylor, general manager; L. Malleson, secretary. Capitalization, £100,000; debentures, £43,000, 7% first mortgage. Lands, 205 acres, at Murrin Murrin, Western Australia, have been abandoned, and smelting plant sold.

MURTEGA MINERALS CO., LTD.**PORTUGAL.**

Offices: 8, Princes St., London, E. C., Eng. Mine office: Barrancos, Alemtejo Province, Portugal. J. D. Massey, chairman; G. St. G. D. Massey, secretary. Organized Dec. 8, 1900, with capitalization £80,000, shares £1 par; issued, £67,207. Lands include five copper mines. Company is endeavoring to open a mine at the presumable point of intersection of 3 main veins, in the center of a hill, under a promising gossan capping, by shaft and tunnel, latter now driving.

MUTOOROO MINE.**AUSTRALIA.**

Office: care of J. P. Winch, Hindley St., Adelaide, South Australia. Mine office: Cockburn, New South Wales, Australia. Lands, 320 acres, leasehold, 14 miles southwest of Cockburn, showing ores in great variety, including cuprite, azurite, malachite, chrysocolla and atacamite near surface, changing in depth to chalcocite, bornite, and chalcopyrite associated with iron pyrites, ores occurring as lenses of considerable size near contact of intrusive rocks. Ores average about 6.5% copper in treatment, and property has paid small dividends.

MUTUAL GOLD & COPPER MINING CO.**WYOMING.**

Office: Rawlins, Wyo. Organized 1899, under laws of Wyoming, with capitalization \$500,000, shares \$1 par. De Forest Richards, president; L. E. Armstrong, secretary. Lands, 4 claims, area 65 acres, in the Battle Lake district of Carbon county, Wyoming, showing an 8' vein opened by a 200' tunnel. Idle.

MYSTIC SHRINE GOLD & COPPER MINING CO.**UTAH.**

Office: 612 McCornick Bldg., Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. Is developing with a small force. E. W. Young, president and general manager; H. B. Cole, vice-president and secretary; W. S. McCornick, treasurer; F. Schefski, superintendent; Vivian P. Strange, engineer. Organized April 7, 1900, under laws of Utah, with capitalization \$1,000,000, shares \$1 par. Lands, 10 patented claims, area 135 acres, in the West Mountain district, showing sundry ore bodies, of which one, ranging from a few inches to 20' in width, and giving average assays of 6.5% copper, 18.8% lead, 10 oz. silver and \$2 gold per ton, from chalcoppyrite and galena, is opened by 4 shafts, deepest 200', and 8 tunnels, longest 700', with about 3,000' of underground openings. Has steam power and is served by the Copper Belt railroad, which passes the mine. Property is regarded as promising.

COMPANIA MINERA LA NACIONAL.**MEXICO.**

Mine office: El Salado, San Luis Potosi, Mex. Miguel Ferrara, president; José Marie Parga, manager. Company operates El Saltillito mines, producing silver, gold and copper. Has steam power and employs 150 to 200 men.

NACAZARA MINING & REDUCTION CO.**MEXICO.**

Letter returned unclaimed from former office, Los Angeles, Cal. Organized July, 1902, to take over a copper-gold property 7 miles from Moctezuma, Sonora. Fred Ohlmeyer, president; J. Irving McKenna, secretary.

NAFVERBERGS KOPPARVERK.**SWEDEN.**

A small property in Kopparbergs län, Sweden. Production in 1902 was 361,800 kilograms of low-grade matte.

NAGAMATSU MINE.**JAPAN.**

Mine office: Okura-mura, Mogami-gori, Uzen, Japan. Ore is chalcoppyrite, associated with iron pyrites and a little sphalerite, in quartz gangue. Has many veins, largest ranging from 6" to 2' in width. Production for 1904 was 620,000 lbs. fine copper.

NAHMINT MINING CO.**BRITISH COLUMBIA.**

Mine office: Alberni, Vancouver Isld., B. C. Property is the Hayes mine, having about one mile of underground openings and a 1-mile aerial tram. Work was suspended in 1902, when mine was said to be nearly exhausted, but later developments at adjoining properties have been of such a promising nature that work was resumed in 1904, and about 20 men were employed at the close of the year. Company plans operating on a considerable scale in 1905.

COMPANIA MINERA DE NALTAGUA.**CHILE.**

Operates the Naltagua mine, opened 1898, in the department of Melipilla, Chile.

NAMAQUA COPPER CO., LTD.**CAPE COLONY.**

Offices: 3, Fenchurch St., London, E. C., Eng. Mine office: Concordia, Little Namaqualand, Cape Colony. Fredk. J. Mirrieles, manager and ex-officio chairman; Francis Phillips, superintendent; A. W. Outram, secretary.

Registered April 23, 1888, with capitalization £200,000, shares £2 par; issued, £188,662. Has paid annual dividends of 7.5% to 40% since organization, excepting 1891 to 1894 and 1901-1902. Paid 5% in 1903 and 7.5% in 1904. Lands, 680 acres leasehold, held on royalty of 2s. 6d. per ton of ore produced. Mines are the Tweetfontein, with 7 shafts; Wheal Julia, with 3 shafts; Flat and New East Centre, with one shaft each; Jubilee, Henderson and Prospect, with 2 shafts each. Has concentrating plants at the Flat and New East Centre mines, where ore is dressed up to 25% to 30% in tenor, for shipment to British smelters via Port Nolloth. Ore is high-grade chalcopryite, occurring with intrusive greenstone traversing granite. Property has considerable ore reserves, and is managed conservatively and ably, having a surplus fund of about £40,000, invested in British consols, and has returned profits of double its capital since organization.

NAMAQUA VENTURE SYNDICATE.

CAPE COLONY.

Mine office: Wittwater, Little Namaqualand, Cape Colony. Was developing a new copper mine, said to be of some promise, at last accounts.

NANAIMO JUBILEE MINING &

BRITISH COLUMBIA.

DEVELOPMENT CO., LTD.

Lands are the Delphi group of 7 claims and the Green Mountain group of 8 claims, in the Dunsmuir district of British Columbia, about 18 miles from the E. & N. railway. Property regarded as promising, though but slightly developed.

NANCOT COPPER CO.

NEW MEXICO.

Letter returned unclaimed from former office, Albuquerque, N. M. Organized October, 1902, under laws of New Mexico, with capitalization \$1,000,000, shares \$1 par.

NANCY HANKS MINE.

MONTANA.

Mine office: Garnet, Granite Co., Mont. Title in dispute. Ores carry gold, silver and copper. Has steam power.

NANTLLE VALE COPPER MINING CO., LTD.

WALES.

Offices: 11, Dale St., Liverpool, England. Mine office: Llanllyfin, Carnarvon, Wales. O. A. Harling, chairman; W. H. Hill, secretary. Organized Sept. 9, 1900, with capitalization £5,000, shares £1 par; debentures, £7,500, protected by first, second and fourth mortgages. Cannot be learned that company ever has done any mining.

NAPA COUNTY COPPER MINING CO.

CALIFORNIA.

Office: 1206 Market St., San Francisco, Cal. Owen Wade, president; F. J. Taylor, secretary and treasurer. Organized August 22, 1902. Lands, 13 miles south of Middletown, Napa Co., Cal., developed by a 400' tunnel.

NAPOLEON & MAGHERA COPPER MINING & REDUCTION CO.

UTAH.

Office: L. B. 537, Cedar Rapids, Iowa. Mine office: care of Don Maguire, president and general manager, Ogden, Utah. Organized 1904, under laws of Utah, with capitalization \$1,000,000, shares \$1 par. Lew Wallace Dean, vice-president; Dr. James W. Dalbey, secretary and treasurer. Lands, sundry claims in the Sierra Madre district of Box Elder county, Utah, on which development work is under way.

NAPOLEON MINE.**CALIFORNIA.**

Mine office: Copperopolis, Calaveras Co., Cal. Owned by Josephine H. Sullivan. Is the oldest copper mine in California, and was once a considerable producer. Vein channel is 100' wide and ranges from diabase to talcose schist, ore bodies occurring in lenses up to 20' wide. Ores are principally sulphide, with a fair sprinkling of carbonates and oxides. Old shaft, 325'. New shaft has been sunk to westward. Considerable copper has been produced, during past few years, by leaching the old dumps.

NASHVILLE MINE.**COLORADO.**

Letter returned unclaimed from former mine office, Idaho Springs, Clear Creek Co., Colo.

NATIONAL CAPITAL COPPER CO.**MEXICO.**

Office: 1901 Seventh St., N. W., Washington, D. C. Mine office: Coapa, Michoacan, Mex. Henry M. Baker, president and treasurer; Francis M. Criswell, secretary; Samuel W. Scott, general manager. Organized April 23, 1902, under laws of Virginia, with capitalization \$150,000, shares \$1 par. Lands, 550 pertenencias, area about 1,375 acres, in the Tacambara district, showing 6 contact veins between granite and limestone, carrying native copper and argentiferous and auriferous oxide, carbonate and sulphide ores. Two veins are being developed by tunnels, the Confianza vein being said to be 70' wide. Nearest railway is the Mexican National, 45 miles distant. Property has ample water available, and is well timbered.

NATIONAL COPPER MINING CO.**UTAH.**

Office: 400 D. F. Walker Bldg., Salt Lake City, Utah. Capitalization \$100,000, shares 10c par. F. E. Smith, president; W. H. Tibbals, vice-president; C. E. Peyton, secretary and treasurer. Lands, circa 115 acres, in the La Sal Mountains, Sonoma district, Grand county, Utah. Ore assaying 9.5% copper, with traces of gold and 17.5 oz. silver per ton, has been taken from a fissure vein traversing sandstone. Presumably idle.

NATIONAL COPPER MINING CO.**WYOMING.**

Office: Douglas, Carbon Co., Wyo. Incorporated July, 1902, with capitalization \$250,000. Frank Tinkham, president; G. W. Johnson, secretary; H. C. Paul, general manager. Lands, sundry claims near Guthrie, Wyoming.

NATIONAL COPPER & GOLD MINING CO.**ARIZONA.**

Office: care of Emil Ganz, Phoenix, Ariz. Organized 1904, under laws of Arizona. Gates M. Fowler, general manager. Lands, the Rogers Springs group, in the Cave Creek district, about 30 miles north of Phoenix, Maricopa county, Arizona, held on \$60,000 bond and lease from W. E. Marlar.

NATIONAL COPPER ORE CO.**VIRGINIA.**

Mine office: Garrisonville, Stafford Co., Va. Supposed to be working deposits of cupriferous iron pyrites.

NATIONAL GOLD & SILVER MINING CO.**NEW MEXICO.**

Mine office: Stein's Pass, Grant Co., N. M. B. L. Berkey, superintendent. Has steam power and 50-ton concentrator.

NATIONAL METAL CO.**MEXICO.**

Office: Guadalajara, Mex. Has ore sampling works at Guadalajara and at Ameca, Jalisco, Mexico.

NATIONAL METALLURGICAL CO.**MEXICO.**

Office: 550 Equitable Bldg., Denver, Colo. Mine office: Matehuala, San Luis Potosi, Mex. Organized under laws of Colorado, with capitalization \$1,000,000, shares \$25 par. Hon. Chas. S. Thomas, president. H. N. Nichols, vice-president and treasurer; John S. Gibbons, secretary. Property is a 100-acre smelter site, 2 water reservoir sites; La Cobriza mine, 50 pertenencias, area 123 acres; the Santa Ana group of auriferous silver lead mines; the San Carlos group of copper-gold-silver claims, area 15 acres; the Concepcion group, 49 acres, carrying copper-gold-silver ores, also 14 other groups of mining claims, area 490 acres. Company has sundry smelting franchises and concessions and is endeavoring to float bonds to raise working capital. Promoters are men of good standing locally, but the company's estimates of profits to result from operation of the prospective smelter won't wash.

NATIONAL MINING CO. CALIFORNIA & BRITISH COLUMBIA.

Office: Tacoma, Wash. Mine office: Waldo, Ore. Capitalization, \$10,000,000. S. J. Pritchard, president; Geo. P. Larsen, secretary; John Sanger, superintendent. Property is the Sanger group of 35 claims, area 700 acres, in Del Norte county, California, a few miles south of Waldo, also sundry mining claims in British Columbia. Also has oil lands in western Washington and several mining claims in the lower Arrow Lake district, British Columbia. The Sanger ores give good assay values in copper and gold, and company is said to plan construction of a smelter. Company may be doing a legitimate business, but its advertising is of such a flamboyant nature that no conservative investor would care to have anything to do with the property.

NATIONAL MINING CO.**MICHIGAN.**

Office: 15 Congress St., Boston, Mass. Mine office: Rockland, Ontonagon Co., Mich. Organized 1878, with capitalization \$2,500,000; issued, \$1,875,000. John C. Watson, president; Daniel L. Demmon, secretary and treasurer. Lands adjoin the old Minnesota mine, now owned by the Michigan Copper Mining Co. Has produced nearly 6,000 tons of copper, and has paid dividends of \$320,000. Idle since 1893. Fully described in Vol. II.

NATIONAL MINING & MILLING CO.**COLORADO & WYOMING.**

Office: 1101 Fisher Bldg., Chicago, Ills. Mine office: Pearl, Larimer Co., Colo. O. S. Richardson, president; Ford H. Rogers, vice-president; J. J. Tufts, treasurer; C. E. Knapp, secretary and general manager; Harold Wilson, superintendent. This company controls the Chatterton Mining Co., Rogers Mining Co., Knapp Mining Co., and Pearl Smelting Co.

The Chatterton Mining Co. owns the Kurtz-Chatterton mine, 7 claims, area 125 acres, in the Upper Platte district of Carbon county, Wyoming, opened by shafts of 30', 35' and 38' and a 1,750' crosscut tunnel, showing 7 veins of low-grade sulphide ore traversing granite, the widest vein, 17',

giving average assays of about 5% copper with a trace of gold, ore being well adapted to concentration. Equipment includes a 5-stamp mill and 50-ton concentrator. Was idle at close of 1904, but resumption contemplated.

The lands of the Rogers Mining Co are 6 claims, area 110 acres, adjoining the Kurtz-Chatterton, opened by a 135' shaft and a crosscut tunnel of 1,100', showing low-grade ores, chiefly malachite, azurite and chalcopryrite.

The lands of the Knapp Mining Co., 9 claims, area 80 acres, in process of patenting, are near Pearl, Larimer Co., Colo. Two fissure veins in gneiss and diorite, opened by shafts of 65' and 85', show chalcopryrite and occasional bornite. The mine has a 25-h. p. steam hoist.

The Pearl Smelting Co. has a 175-ton blast furnace, with 175-h. p., steam plant, planned to do custom smelting as well as treating the ores of its allied properties. The smelter is incomplete, but the company plans to finish the plant and put it in blast in 1905.

NATIONAL SMELTING CO.

SOUTH DAKOTA.

Office, mine and works: Rapid City, Pennington Co., S. D. Mines ores carrying gold, silver and copper, latter being secured as a by-product. Has a large smelter, employing about 200 men.

NATIONAL SMELTING & REFINING CO.

NEW MEXICO.

Mine office: Lordsburg, Grant Co., N. M. Has a 50-ton smelter, built 1903, on the Aberdeen property, and held a contract to smelt ores of that moribund corporation.

NAVERFJORD MINES.

NORWAY.

Mine office: Naverfjord, Norway. Production in 1902 was 160 tons of first-grade and 1,500 tons of second-grade ore, containing metallic values equal to about 180 tons of refined copper.

NEGOCIACION MINERA REAL DEL MONTE,

MEXICO.

UNION y BILBAO.

Mine office: Ojocaliente, Zacatecas, Mex. H. Dalonne, owner and manager. Has cupriferous silver-lead ores. Employs about 125 men and uses horse power, but plans installing steam plant and small mill.

NELSON COPPER FIELDS, LTD.

BRITISH COLUMBIA.

Offices: 57, Moorgate St., London, E. C., Eng. Mine office: Nelson, B. C. H. Shepherd Cross, chairman; C. S. Good, secretary. Capitalization, £100,000. Lands, 344 acres, on Morning Mountain. Idle since 1900.

NELSON COPPER SYNDICATE, LTD.

BRITISH COLUMBIA.

Organized January, 1905, under laws of British Columbia, with capitalization \$10,000, shares \$100 par.

GEWERKSCHAFT NEUE KIRCHE.

GERMANY.

Mine office: Gross-Schlieffensteinthal bei Goslar, Harz, Germany.

C. NEUMANN & CO.

CAPE COLONY.

Said to be developing copper mines in Little Namaqualand, Cape Colony, South Africa.

NEVADA BELL COPPER MINING & REDUCTION CO.

NEVADA.

Office: 850 Drexel Bldg., Philadelphia, Pa. Mine office: Lovelock,

Humboldt Co., Nev. Organized 1902, under laws of Nevada, with capitalization \$5,000,000, absorbing the Nevada Copper Co. and the Bell Mare Mining & Smelting Co. C. W. Sweitzer, president; H. H. Barbee, vice-president; A. P. Platt, secretary and treasurer. Lands, circa 500 acres, on which considerable development has been secured. The 500' Bell Mare tunnel is planned to be driven 1,500', to cut the vein found in the Copper King tunnel. Ore bodies are said to be large, but of low grade, averaging about 4% copper, and occurring as replacements in a formation of andesitic porphyry. Has good power equipment, and a 60-ton smelter built by the Nevada Copper Co.

**NEVADA CONSOLIDATED COPPER & GOLD
MINING & MILLING CO.**

NEVADA.

Office: 506-31 State St., Boston, Mass. Mine office: Yerington, Lyon Co., Nev. Organized under laws of Maine, with capitalization \$1,000,000, shares \$1 par. Jas. P. Niles, president and general manager; Jas. D. Niles, treasurer. Lands, 16 copper claims in Lyon county, and 12 gold claims in Lincoln county, Nevada, former including the Bunker Hill and Redemption groups. Has electric power and a 50-ton smelter. Former secretary states that present officers were elected without due notice to shareholders, and that through lack of harmony and mismanagement of mine, liquidation seems the only solution of the muddle.

NEVADA CONSOLIDATED SMELTING & REFINING CO.

NEVADA.

Office: 201 Exchange Bldg., Denver, Colo. Works office: Pioche, Lincoln Co., Nev. Wm. Gelder, manager. Has a 200-ton smelter and 22 miles of narrow-gauge railroad. Is closely affiliated with the Hillside Copper Co.

NEVADA COPPER CO.

NEVADA.

Merged, 1902, in Nevada Bell Copper Mining & Reduction Co.

NEVADA DEVELOPMENT CO.

NEVADA.

Office: 201 Walnut Pl., Philadelphia, Pa. Mine office: Lovelock, Humboldt Co., Nev. Theo. H. Lowe, superintendent. Lands include the Copper Glance and adjoining claims.

NEVADA GOLD & COPPER MINING CO.

NEVADA.

Office: Parrot Bldg., San Francisco, Cal.

**NEVADA-UTAH MINES & SMELTERS
CORPORATION.**

NEVADA & UTAH.

Office: 100 Broadway, New York. Mine offices: Bingham Canyon, Salt Lake Co., Utah, and Pioche, Lincoln Co., Nev. Organized 1904, under laws of Maine, with capitalization \$15,000,000, shares \$10 par. Bonds, \$1,000,000 authorized, 5-year registered 6% gold bonds, due Dec. 1, 1909, convertible at option of holders, after Dec. 1, 1906, into common stock at par. Col. John Weir, president; Edw. F. Cragin, vice-president; Heman Dowd, treasurer; C. J. Caughey, secretary; John R. Dos Pasos, general counsel; John Weir, Hon. A. B. Lewis, A. S. McCornick, Edward F. Freudenthal, Edw. F. Cragin, J. P. Haines, Chas. J. Hodge and John W. Griggs, directors.

Landed holdings are very extensive including the Imperial, Montreal and Comet mines, in Beaver county, Utah; the Last Chance mine, at Bingham Canyon, Salt Lake county, Utah, and the Manhattan and Pioche Consolidated mines and the Bullionville tailings, at Pioche, Lincoln county, Nevada.

The Last Chance group, taken over from the New England-Utah Mining Co., is 13 claims, area 115 acres, in the West Mountain district of Salt Lake county, Utah, showing sundry contact and fissure veins of 3' to 50' width, carrying good values in copper, lead, silver and gold, developed by tunnels aggregating 7,000', and having about 2 miles of underground openings. Equipment includes a 100-ton concentrator. The Last Chance is regarded as well located and a promising property.

The Montreal group, area 300 acres, adjoins the Old Hickory mine of the Majestic, in Beaver county, Utah, and has shipped ore giving smelter returns of 30% copper. The Montreal is not extensively developed, but shows large deposits of auriferous and argentiferous copper ore, and is a property of exceptional promise.

The Imperial group, which includes the Comet mine, area 400 acres, lies near the Horn Silver, Cactus and Majestic mines. The Imperial group, developed by tunnels, has carbonate ores above and sulphides at little depth, which give assays up to 30% copper, 15% lead, 18 oz. silver and \$1 to \$9 gold per ton. Ore is mainly of concentrating grade, but considerable high-grade ore has been shipped to smelters from time to time. The Comet mine of the Imperial group adjoins the Cactus, and has rail connections. The Comet undoubtedly carries a continuation of the Cactus vein of the Newhouse Mines and Smelters, and has considerable development, ore being mainly of concentrating grade and carrying fair values in copper, gold and silver.

The Manhattan group, near Pioche, Lincoln county, Nevada, has 55 claims, with about 2,000' of development, showing large bodies of low to medium-grade ore. The Pioche Consolidated, near the Manhattan, has 63 claims, and has been developed extensively, being popularly credited with a production of about \$20,000,000 in the past. The Pioche has a 300-ton smelter and a good mining equipment. Nearest railway, 18 miles distant, is expected to build to the mines. The Bullionville tailings contain about 150,000 tons of sands and slimes, the residue from the Pioche ores milled, which assay \$16.43 per ton in gold, silver and lead, and which a modern concentrating and slimes plant should be able to rework at a good net profit.

The Nevada-Utah possesses a number of mines of more than average promise, and with vigorous development and good management, should become a large and profitable producer of copper, lead, silver and gold.

NEW AMERICAN MINING & MILLING CO.

UTAH.

Mine office: Brigham, Box Elder Co., Utah.

NEW ARIO COPPER & EXPLORATION CO., LTD.

MEXICO.

Offices: 35, Lamb's Conduit, London, W. C., Eng. Mine office: Ario,

Michoacan, Mex. R. Gautier, managing director; G. Harmant, secretary. Organized March 27, 1897, with capitalization £100,000, shares 4s. par; issued, £90,422. Property is sundry copper claims, near Ario. Cannot be learned that any work is in progress or contemplated.

NEW BALLA BALLA COPPER MINES, LTD.

AUSTRALIA.

Offices: 6, Great St. Helen's London, E. C., Eng. Mine office: Port Balla Balla, Western Australia. T. W. Williams, chairman; E. A. Foster, secretary; A. Harding, legal manager in Western Australia. Organized Apr. 16, 1901, as a reconstruction of the Balla Balla Copper Mines, Ltd., with capitalization £250,000, shares £1 par; issued, £186,000. Lands, 120 acres, in two groups, in the Pilbarra district, 11 miles from Port Balla Balla, and one mine 50 miles distant. Has a 30-ton smelter. Shareholders are in litigation over proposal to liquidate.

NEW BOSTON MINING CO.

MONTANA.

Office: Eden Valley, Minnesota. Mine office: Corbin, Jefferson Co., Mont. Ores carry gold and copper. Company advertises that its stock will make its shareholders wealthy, and that its stock is "fully guaranteed by 10-year gold bonds bearing 3% interest—50 per cent commission to agents—why not become a mining king?" Is a mere stock-jobbing outfit, of course.

NEW CALEDONIA COPPER CO., LTD.

NEW CALEDONIA.

Reorganized as Caledonia Copper Co., Ltd.

NEW CHILLAGOE RAILWAY & MINES, LTD.

AUSTRALIA.

Offices: 39, Queen St., Melbourne, Australia, and Finsbury House, London, E. C., Eng. Mine office: Chillagoe, North Queensland, Australia. Employed 750 men until June, 1904. Organized Feb. 12, 1902, under laws of Queensland, with capitalization £1,000,000, shares £1 par; issued, £688,983. Debentures, £500,000, at 6%. J. S. Reid, chairman; C. L. Hewitt, secretary in Melbourne; E. Habben, secretary in London; T. J. Greenway, general manager; Fred. Back, superintendent.

Property is railway and mineral concessions, granted by the Queensland government. The railroad, of 102 miles, runs from Mareeba to Chillagoe. Mineral concessions are 9 groups of 70 leases, area about 2,500 acres, held on 50-year lease from Jan. 1, 1898, at an annual rental of £1 per acre, with exemption from labor conditions, also about 1,200 acres of ordinary mineral leases. Is the parent company of the Mungana (Chillagoe) Mining Co., Ltd. Principal mining properties are the Penzance, Zillmanton, Queenslander, McIlwraith, Harper, Hobson, Titree, Hensey, Redcap, Calcifer and Boomerang, of which the two first named are the more important, the Penzance showing a good body of 5% to 8% ore.

The smelter has one lead furnace and 5 copper furnaces, of about 100 tons daily capacity each. Blowers are driven by steam engines and an electric plant, and the smelter has a single converter, but much of the product is turned out as matte of 50% copper tenor, carrying 55 oz. silver per ton, shipped to Europe for conversion and refining. Ore is exchanged with the Mungana company, giving better fluxing mixtures to both, and the Mungana ores also are smelted by this plant. Water is furnished by a

1,500,000-gallon dam across Chillagoe Creek, this stream having a minimum flow of about 4,000 gallons per hour. Fuel is wood, coal and coke, latter, for blast furnaces, costing 10 shillings per ton. Production was 153 long tons fine copper in 1902 and 1,180 tons in 1903, average grade of ore being 4.82% in copper tenor. All work was suspended June, 1904, and at last accounts from Queensland the mine and works were idle. The ore reserves of the mine apparently were overestimated, and other causes contributed to the suspension. Debenture coupons, due April and October, 1904 were unpaid at close of year, and a committee representing bondholders is endeavoring to reach some settlement with the company, by which their interests will be protected without taking over the mines and railway.

NEW CLONCURRY COPPER & SMELTING CO., LTD. . AUSTRALIA.

Offices: 116, St. Vincent St., Glasgow, Scotland. R. L. Alston, chairman; B. F. G. Meldrum, secretary. Organized Oct. 29, 1895, with capitalization £3,300, shares 6s. each. Lands, sundry small mines in North Queensland, which are idle.

NEW COLUMBIA MINING CO. IDAHO.

Mine office: Salmon, Lehmi Co., Idaho. H. Armstead, superintendent. Ores carry copper and gold. Has steam power and 10-stamp mill.

NEW ENGLAND & ARIZONA COPPER & GOLD MINING CO. ARIZONA.

Office: Lowell, Mass. Mine office: McCabe, Yavapai Co., Ariz. Edmund D. Fisk, president; Leonard T. Farris, vice-president; John A. Thompson, secretary and treasurer; C. M. Egge, superintendent. Organized January, 1901, under laws of Arizona, with capitalization \$750,000, shares \$1 par. Lands, 5 claims, known as the Red Star group, near the Silver Belt mine, in the Big Bug district. Has steam hoist and about 300' of underground openings. Management considered honest.

NEW ENGLAND & CLIFTON COPPER CO. ARIZONA.

Office: care of E. Rollins Morse, president, 43 State St., Boston, Mass. Mine office: Clifton, Graham Co., Ariz. Arthur P. Ayling, general manager; C. C. Burger, consulting engineer. Capitalization \$5,000,000, in \$2,000,000 preferred 8% stock, cumulative after payment of first 8% dividend, and \$3,000,000 common stock, with \$1,000,000 preferred and \$500,000 common stock unissued. Present company succeeded the New England Copper Co. and the Clifton Consolidated Copper Mines of Arizona. Lands, 78 claims, area 1,006 acres, with about 13,000' of underground openings in the two mines. The Clifton has 7 shafts of 70' to 315', also tunnels of 220', 450', 700', 800', 1,000' and 1,700', showing principally chalcopryite and chalcocite, with occasional oxides and carbonates, all slightly auriferous and argentiferous. The main vein is said to show an extreme width of 150'. Plans of former management of the Clifton called for the driving of a 7,700' drainage and operating tunnel, to have double tracks and electric haulage. The New England is opened by shafts of 400' and 500' and a 2,000' tunnel, showing fissure veins instead of the blanket veins noted at Clifton, 3 miles distant. Principal vein is 5' to 6' wide, carrying cuprite, chalcocite and chalcopryite,

all of very high grade, this ore being among the richest found in the Clifton district in quantities of commercial importance. The mines show a large amount of ore, of all grades from very poor to very rich.

The properties have steam, electric and gasoline power. A large concentrator is planned and company also intends building an aerial tram connecting the mines with the millsite upon the river, but does not plan the immediate construction of a smelter. The company's management is excellent, and the properties are of exceptional promise, but several years of development, and large cash expenditures, will be required to bring the company to the point of profitable production upon a considerable scale.

NEW ENGLAND-COLORADO COPPER MINES CO.

Letter returned unclaimed from former office, Denver, Colo.

NEW ENGLAND GOLD & COPPER MINING CO.

UTAH.

Office: 18 Tremont St., Boston, Mass. Mine office: Bingham Canyon, Salt Lake Co., Utah. Organized June, 1899, under laws of Colorado, with capitalization \$1,000,000, shares \$1 par; issued, \$748,945. Bonds, \$66,600 issued, at 6%. D. W. Williams, president; Thomas Kellough, vice-president; Geo. F. Bradstreet, secretary and treasurer; Henry M. Adkinson, general manager; D. J. Cook, superintendent. Lands, 8 claims, patented, area 27 acres, in the West Mountain district, favorably located, property having made considerable production before coming into present ownership. Development is by a 159' shaft, and the Nast tunnel of 1,500' and the Benton tunnel of 1,600', both driven on the vein. Ore body is a fissure vein in porphyry, averaging 3' width, carrying sulphide ores averaging about 35% lead, 2% zinc, 14 oz. silver and \$4.50 gold per ton, with small copper values, these being likely to increase later. Mine has about 8,000' of underground openings. The 50-ton concentrator of wood, 50x125', has a Sturtevant crusher, 2 trains of rolls, 2 Hartz jigs and one Wilfley table. Concentrates are shipped to the United States smelter. Funds for development have been furnished mainly by a few large shareholders, and none of the general officers draw salaries. Property seems well managed and promising.

NEW ENGLAND MINING CO.

MASSACHUSETTS.

Office: 35 School St., Greenfield, Mass. Mine office: Charlemont, Franklin Co., Mass. Othello A. Fay, president; Capt. Geo. H. Davenport, treasurer and general manager. Organized 1902, with capitalization \$500,000, shares \$5 par. Lands, about 1,000 acres, 2 miles west of the Davis pyrite mine, latter worked since circa 1880. Vein is approximately vertical, conforming closely in dip and strike with the Savoy schist in which it occurs, and apparently is a fahlband, lacking well defined walls, ore occurring scattered through 15' to 20' of the schist, with a 6" to 1' vein of quartz, well mineralized on the south wall, and a heavy impregnation of chalcopyrite, 1' to 2' wide, on the north wall. Is opened by crosscutting and stripping, with vein traced about 700'.

NEW ENGLAND-UTAH MINING CO.

UTAH.

Property taken over, 1904, by Nevada-Utah Mines & Smelters Corporation.

NEW ERA MINING CO.**MEXICO.**

Had copper claims south of La Cananea, Sonora, Mexico, circa 1902.

NEW HIGHLAND GOLD & COPPER MINING CO.**CALIFORNIA.**

Office: 1209 Broadway, Oakland, Cal. Mine office: Georgetown, El Dorado Co., Cal. Employs 12 men. Organized, Sept. 11, 1903, under laws of California, with capitalization \$2,000,000, shares \$1 par. Thos. F. Graber, vice-president; C. L. Colvin, secretary and treasurer; Ira C. Jenks, financial secretary; J. A. Parker, superintendent. Lands, 11 copper claims and 9 gold claims, area 555 acres, on the Mother lode, in the Georgetown district, showing a fissure vein in slate giving assays of 15% copper, 15 oz. silver and \$2.50 gold per ton. Is developing the gold property only, at present.

NEW JERSEY METAL REFINING WORKS, LTD.**NEW JERSEY.**

Works office: Elizabeth, N. J. Owned by Mountain Copper Co., Ltd.

NEW LONDON COPPER MINE.**MARYLAND.**

Office: care of Capt. Edward S. Wertz, owner, Washington, D. C. Property, in Frederick county, Maryland, includes 64 acres of mineral land and 14 acres of timber land. Mine was worked, 1835-1855, and is said to have yielded a profit. Idle since 1888, until 1903-04, when unwatered and shaft retimbered, but no ore extracted. Ores are bornite and chalcocite, in a vein of 3' to 4' in dolomite, with bands of phyllite, ores assaying 3.5% to 70% copper. Has 4 tunnels, longest 104', and a 210' shaft, with about 500' of underground openings.

NEW MAMMOTH MINING & MILLING CO.**UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. J. E. Beveridge, superintendent, at last accounts. Ores carry gold, silver and copper. Has steam power.

NEW MEXICO COPPER MINING & SMELTING CO.**NEW MEXICO.**

Letters returned unclaimed from former office, Hartford, Conn., and former mine office, Lucera, Mora county, New Mexico.

NEW MEXICO DEVELOPMENT CO.**NEW MEXICO.**

Mine office: Fierro, Grant Co., N. M.

NEW MEXICO GOLD & COPPER MINING CO.**NEW MEXICO.**

Office: 39 Cawker Bldg., Milwaukee, Wis. Mine office: Tres Piedras, Rio Arriba Co., N. M. Employs 8 men. Organized 1897, under laws of New Mexico, with capitalization \$2,500,000, shares \$1 par. Wm. H. Devos, president; M. D. Kelly, secretary and treasurer; Richard Cole, superintendent. Lands, 11 claims, area 140 acres, in the Bromide district, showing fissure veins in schists and contact veins between schist and granite. Five veins are being developed, these averaging 7' in width and giving assays of 5% to 40% copper, with occasional high values in gold, from native copper, carbonate and sulphide ores. Has a 130' shaft and 265' of underground openings, with steam power and Norwalk air compressor. Company has platted a townsite called Bromide City, and was trying to replenish its depleted exchequer by sale of town lots at last accounts, in addition to which an issue of \$25,000 of 7% gold bonds is being offered shareholders, who do not evince any marked enthusiasm in buying same.

NEW MICHIGAN COPPER MINING CO.**WYOMING.**

Office: Laramie, Wyo. John M. Arthur, superintendent.

NEW MOUNT HOPE COPPER MINING CO., LTD.**AUSTRALIA.**

Mine office: Mt. Hope, N. S. W., Australia. R. M. Kirk, general manager. Mine, opened 1878, is about 90 miles south of the Great Cobar. Deepest shaft is 400'. Ores are mainly chalcopryite and bornite, with sandstone gangue, in a country rock of ferruginous slates and sandstones, with oxidized ores mainly earthy carbonates above the 250' level. Ore bodies occur as replacements in the country rock, without defined walls, having an extreme width of 80'. General formation and physical features resemble the Great Cobar mine. Ore is concentrated about 5 into 1, and is smelted in a plant having 5 small furnaces, using iron ore secured 12 miles distant for a flux. Made 5,070 long tons refined copper, 1878-1898, inclusive.

NEW RED WING MINING CO.**UTAH.**

Office: Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. Organized, circa 1900, as successor to Red Wing Gold Mining Co., with capitalization \$500,000. Has a \$50,000 bond issue. Lands are sundry well-located claims in the West Mountain district, from which considerable ore has been produced in the past.

NEW RIO TINTO COPPER CO., LTD.**SPAIN.**

Absorbed by Caridad Copper Co., Ltd.

NEW RIVER COPPER CO.

Organized August, 1902, under laws of Delaware, with capitalization \$1,000,000. Location of lands, if any, unknown.

NEW SLEEPY HOLLOW GOLD MINING CO.**COLORADO.**

Mine office: Black Hawk, Gilpin Co., Colo. John F. Hopkins, superintendent. Ores carry gold, silver and copper. Has steam power.

NEW YELTA COPPER MINING & SMELTING CO., LTD.**AUSTRALIA.**

Mines sold to Paramatta Copper Mines, Ltd.

NEW YORK GROUP.**ARIZONA.**

Office and mine: care of T. R. Nellis, owner, Williams, Coconino Co., Ariz.

NEW YORK MINE.**ARIZONA.**

Office: care of Henry J. Bennett, owner, Phoenix, Ariz. Mine office: Morristown, Maricopa Co., Ariz. Has a 100' shaft on a 3' vein. Also has a 15' vein giving assays up to 60% copper.

NEW YORK-ALASKA MINE.**ALASKA.**

Office: care of Saml. Silverman, general manager, Ketchikan, Alaska. Property is near the Brown-Alaska, on Prince of Wales Island.

NEW YORK & ARIZONA COPPER MINING & SMELTING CO.**ARIZONA.**

Office: 261 Broadway, New York. Letter returned unclaimed from former mine office, Globe, Gila Co., Ariz. Organized 1901, with capitalization \$3,000,000, shares \$10 par, to sell stock. Lionel Hagenas, president; E. G. Macqueston, secretary. Property considered promising, but company considered worse than dubious.

NEW YORK-CANADIAN COPPER CO., LTD.**ONTARIO.**

Office: Port Arthur, Ont. Mine office: Kashabowiwe, Rainy River district, Ont. Capitalization \$1,000,000, shares \$10 par. W. G. Pollock, president; Peter L. Kimberly, vice-president; Harry Folger, secretary and treasurer; B. W. Folger, general manager; Tom R. Jones, superintendent. Lands, 4 claims, area 365 acres, 6 miles from Kashabowiwe, on Round Lake, Moss Twp., showing 3 contact veins between diorite and schist, of which two average 25' width and are opened by shafts of 50' and 208', giving average assays of 7% copper, 1.5 oz. silver and 60c. gold per ton, with about 50,000 tons of ore in sight and about 4,000 tons on the dumps. Has a 120-h. p. steam plant, with hoist and 5-drill Ingersoll-Sergeant air-compressor. Company planned erecting a 50-ton smelter in 1904, but closed down instead, ostensibly because of excessive freight rates charged by the Canadian Northern Railway.

NEW YORK COPPER MINING & SMELTING CO.**ARIZONA.**

Office: Tucson, Ariz. Mine office: Vails, Pima Co., Ariz. F. H. Lee, president; E. J. Tripple, secretary; H. Buehman, treasurer. Lands, 6 claims, in the Helvetia district, on which a little prospecting has been done.

NEW YORK & MONTANA COPPER MINING CO.**MONTANA.**

Mine office: Corbin, Jefferson Co., Mont. Organized 1903, under laws of Delaware, with capitalization \$1,000,000, shares \$1 par. Employs about 50 men. J. H. McCabe, general manager; E. J. Mathews, superintendent. Lands, circa 250 acres, including the Erickson, Scioto and Copper Gulch groups, in the Corbin district, opened by 3 two-compartment shafts, which are said to make a good showing of medium-grade ore.

NEW YORK & NEVADA COPPER CO.**NEVADA.**

Bankrupt. Fully described in Vols. III. and IV.

NEW YORK-SEATTLE COPPER MINING CO.**WASHINGTON.**

Office: care of C. F. Oliver, president, Hoboken, N. J. Mine office: Index, Snohomish Co., Wash. R. H. Hingston, superintendent. Property is said to show a 20' vein of copper ore, traceable 500', developed by tunnel, and a 2' vein developed by 212' shaft, giving assay values of \$40 per ton.

NEW YORK & VIRGINIA COPPER CO.**VIRGINIA.**

Office: 149 Broadway, New York. Mine office: Woltz, Carroll Co., Va. Organized 1901, under laws of West Virginia, with capitalization \$2,500,000, shares \$1 par. Ambrose C. Dunn, president and general manager; Wm. D. Boggs, secretary and treasurer; James Lawson, superintendent. Lands, 740 acres, showing 7 cupriferous fissure veins and 2 gold veins, with 2 copper veins developed by shafts of 372' and 381' and by two tunnels of 100' each. Largest vein is said by company to average 96' width and to show argentiferous melaconite, bornite and chalcopyrite carrying 10% copper, 25 oz. silver and 1 oz. gold per ton. Has steam power. Is developing conservatively, and has about 40,000 tons of smelting ore on the dumps, with a larger amount blocked out for stoping.

NEW ZEALAND COPPER ESTATES CO., LTD.**NEW ZEALAND.**

Moribund.

NEWFOUNDLAND COPPER CO., LTD.

Absorbed by Carmen Copper Mines, Ltd.

NEWFOUNDLAND.**B. NEWGASS & CO.****SPAIN.**

Offices: 7, Lothbury, London, E. C., Eng. Lands, at Arrieta and Changoa, Navarra, Spain, include the Ollin, Arrieta and Changoa mines, these carrying silver, lead and copper ores. Idle.

NEWGATE MINE.**CONNECTICUT.**

An old and idle property at Granby, Hartford county, Connecticut.

NEWHOUSE MINES & SMELTERS.**UTAH.**

Offices: 522-52 Broadway, New York, and Salt Lake City, Utah. Mine office: Frisco, Beaver Co., Utah. Employs about 50 men. Organized May, 1903, under laws of New York, with capitalization \$6,000,000, apparently succeeding the Cactus Smelting & Mining Co. Saml. Newhouse, president; M. M. Johnson, general manager; W. C. Thomas, superintendent; Jos. Dedrichs, mill superintendent; Geo. K. Fischer, consulting metallurgist and mechanical engineer; R. H. Strickland, engineer.

Lands, in Copper Gulch, 7 miles from Frisco, are very extensive, including the Cactus group. The Cactus is developed by a 600' 3-compartment shaft and a tunnel to be 5,980' long, which is nearing completion. This tunnel reaches the mine on the 600' level, connecting with the shaft, and will care for the total production of the property for some years to come. Trimming will be done by electric locomotives hauling 4-ton steel cars. At the mouth of the tunnel the cars will be run into a great steel tube, which will be partially rotated and the ore in the cars dumped onto grizzlies, oversize going to bins and thence to heavy crushers. The Newhouse tract carries upwards of a mile of the strike of the great Cactus vein, the Cactus ores ranging from 3% to 7% copper tenor for the milling grades, with considerable smelting ore running up to 25% copper, all grades of ore being both auriferous and argentiferous. The milling ores should concentrate about 6 into 1. The mine is estimated to show about 2,000,000 tons of ore of all grades.

The concentrating plant is under a single roof, the building being 150x400' in size. The western portion, which is the concentrator proper, is of structural steel with corrugated iron siding and roof, while the power-plant section, 55x110, at the east, is of structural steel and brick. The concentrator is designed on the unit system, allowing for future expansion, and the first unit, of 800 tons daily capacity, was nearing completion at the close of 1904. The equipment includes 4 sets of crushing rolls, 4 sets of elevators, 24 sets of 2-compartment jigs, 34 Wilfley tables, 8 Wilfley slimers and Sherman settling tanks and classifiers. A 15-ton Whiting traveling crane allows easy handling of heavy machinery.

The power plant includes three 350-h. p. Babcock & Wilcox water-tube boilers, and a Green fuel economizer, with a 165' self-supporting steel smokestack of 8' diameter. There is a 2,500' Ingersoll-Sergeant air compressor and two 500-h. p. Westinghouse-Parsons steam turbines, making 3,600 revolutions per minute, direct-connected with two 400-kw. Westing-

house generators that furnish all power, except compressed air, used in the mine and mill.

The mine and mill are connected by the Newhouse, Copper Gulch & Sevier Lake standard-gauge railroad, $3\frac{1}{4}$ miles in length, having maximum gradients of 4%, with a 65-ton Shay mountain-climbing locomotive. Rail connection has been secured with Frisco also. Water is secured from 6 large springs, at Wah Wah, 8.5 miles from the mill, through a line of 12" and 14" riveted steel pipe, laid across Preuss valley, and discharging into a cement reservoir on high ground above the mill and townsite, this line furnishing 1,500 gallons per minute. The townsite, called Newhouse, is near the mill, and the company is building a brick hotel to accommodate 150 men therein.

The Newhouse company has contracted to deliver its entire production for 10 years, in the form of shipping ore and concentrates, to the American Smelting & Refining Company's plant at Murray, but there is some talk that this contract has been turned over to the Bingham. The Newhouse is under excellent management, and is an enterprise of vast possibilities.

NEWPORT & ARIZONA COPPER & GOLD MINING CO.

Letter returned unclaimed from former office, 60 State St., Boston.
NEWS BOY COPPER MINING CO. **WYOMING.**

Mine office: Encampment, Carbon Co., Wyo. Has steam power.
NEWS COPPER MINING CO. **ARIZONA.**

Office: care of F. August Heinze, Butte, Mont. Property is a group of claims near the United Verde mine, at Jerome, Yavapai county, Arizona.
NEWTON COPPER CO. **CALIFORNIA.**

Office: 420 Montgomery St., San Francisco, Cal. Mine office: Ranlett, Amador Co., Cal. Organized 1887, under laws of California, with capitalization \$200,000, shares \$5 par. Horace D. Ranlett, president and general manager. Lands, 100 acres, patented, showing 3 fissure veins in slate, carrying an average of 8% copper, mainly in sulphide ores. Mine was opened 1861, and has shafts of 200' and 430', with about 20,000 tons of ore in sight. Has steam power, and smelter with an 80-ton water-jacket blast furnace making 50% matte, also a 100-ton leaching plant, ore being especially adapted to lixiviation.

NIAGARA COPPER CO. **ARIZONA.**

Office and mine: Prescott, Yavapai Co., Ariz. Herman Voge, president and general manager; John P. Bauder, secretary. Lands, 7 claims, in the Copper Creek district, near the Hillside property, opened by shafts of 60', 60' and 125', also several tunnels, showing what apparently is a considerable body of low-grade ore, with footwall and hanging-wall pay-streaks that have given assays up to 54% copper, 9 oz. silver and \$1.65 gold per ton.

NIAGARA MINING & DEVELOPMENT CO. **BRITISH COLUMBIA.**

S. Arden Singlehurst, manager. Lands are in Kitsalas Canyon, on the Skeena river, in the extreme northern part of British Columbia, near the Alaskan line.

NIAGARA MINING & SMELTING CO.

UTAH.

Control of property held, through ownership of majority of stock, by United States Mining Co.

NIBLACK COPPER CO.

ALASKA.

Offices: 310 American Trust Bldg., Cleveland, Ohio, and 39 University Bldg., Milwaukee, Wis. Mine office: Niblack Anchorage, Prince of Wales Island, Alaska. Organized Oct. 12, 1904, under laws of Arizona, with capitalization \$250,000. M. P. O'Brien, president and treasurer; F. B. Richards, vice-president; S. C. Vessy, secretary; John P. Christopher, superintendent; Benedict Crowell, consulting engineer; A. L. Christopher, engineer. Ore outcrops at high tide, and outcrops were traced back for 200', until lost under heavy overburden, at which point a shaft was sunk 178'. Ore occurs as lenses in greenstone, deposit now being worked having a width of 60', and product assaying 6% to 11% copper in the bins. About half of the lense is being mined, the remaining 30' running about 3% copper only. Ore is chalcopryite, carrying about \$1.50 in gold and silver per ton, with about 25% iron, 25% sulphur and 30% silica. Property also shows deposits of chalcopryite and covellite in quartz-sericite schists, at present undeveloped. Company is building a wharf and ore bunkers connecting directly with the shaft. Harbor is one of the best in Alaska, land-locked and capable of admitting the largest ocean-going vessel. Ore wharf is built similar to those of the iron shipping ports of Lake Superior. A large lake will give a working head of 290', and should develop about 3,000 h. p., with water-wheels. Equipment includes boilers, hoist and small air compressor. Company has contracted with the Tacoma Smelting Co. to treat a maximum of 200 tons daily. Ore will be shipped 600 miles by steamer, at a freight rate of \$1 per ton. Management is excellent and property is one of considerable promise.

NICHOLS CHEMICAL CO.

QUEBEC.

Office: 25 Broad St., New York. Mine office: Capelton, Sherbrooke Co., Quebec. Works office: Laurel Hill, N. Y. W. H. Nichols, president; J. B. F. Herreshoff, vice-president; J. M. Luther, secretary; E. R. Nichols, treasurer; S. L. Spofford, mine manager. The Capelton property, area 640 acres, carries lenses of chalcopryite and iron pyrites, former averaging 5% copper and 38% sulphur, developed by 6 shafts, 4 of less than 500', one of 800' and one of 2,000', with about 5 miles of underground openings. Has steam power, 150-ton concentrator, and smelter turning out 50% matte, employing about 100 men. At the Laurel Hill works the company has a smelter and 120-ton electrolytic copper refinery, using steam and electric power and employing about 250 men.

NICKEL-COPPER CO.

ONTARIO.

Office: Worthington, Ont. Lands are in Drury Twp., near Sudbury, Algoma, Ont. Experimented with a new process of reducing nickel-copper ores, with usual results of failure. Affairs botched by management, but property considered promising.

NICKEL PLATE MINE.

BRITISH COLUMBIA.

Mine office: Hedley, B. C. Owned by Rogers Bros., et al. A. Munson,

manager. Ores carry gold, silver and copper. Has water and electric power and 40-stamp mill.

NIGHT HAWK MINING CO.

WASHINGTON.

Office: 201 Uihlein Bldg., Milwaukee, Wis. Mine office: Loomis, Okanogan Co., Wash. Employs 10 to 15 men. Organized 1901, under laws of Washington, with capitalization \$5,000,000, shares \$1 par. A. M. Wehe, president and general manager; H. D. James, secretary and treasurer; A. Geo. Wehe, superintendent. Lands, 65 claims, area 1,350 acres, also 150 acres miscellaneous lands, including millsite and townsite, on Mt. Ellemeham, in the Wannacut Lake district, 68 miles from a railroad, showing numerous fissure veins, of which 5 are being developed, these ranging 6' to 10' in width, and giving estimated average values of 8% copper and 1 oz. gold per ton. Development is by 2 shallow shafts and 2 tunnels, longest 1,200'. Management considered honest and property promising.

NIGHTHAWK MINING & TUNNEL CO.

WASHINGTON.

Mine office: Conconully, Okanogan Co., Wash. Lands, sundry claims developed by tunnel of 1,150'.

NIPPER CONSOLIDATED COPPER CO.

MONTANA.

Office: 31 Nassau St., New York. Mine office: Butte, Silver Bow Co., Mont. Employs about 250 men. Capitalization, \$3,750,000; bonded debt, \$2,500,000. F. August Heinze, general manager; Stanley Gifford, secretary and treasurer. Is a subsidiary corporation of the United Copper Co. Mine is developed by 2 shafts of about 1,000' each, timbered with 10x10" square sets, having 12 exits, good ventilation and underground connections with the Parrot, Never Sweat and Little Minah mines. Has a good machinery equipment. Company is engaged in continuous and extensive litigation with various subsidiary corporations of the Amalgamated Copper Company.

NISHINOKAWA MINE.

JAPAN.

Mine office: Oboki-mura, Nii-gori, Iyo, Japan. Ores are chalcopyrite, associated with iron pyrites, hematite, magnetite and sphalerite, in a quartz gangue, averaging 3% to 4% copper and occurring as lenses 3' to 12' thick in quartz-schists. Production for 1900 was 183,415 lbs. fine copper.

NIZINA GOLD & COPPER CO. OF ALASKA.

ALASKA.

Office: care of S. Thornton Langley & Co., Seattle, Wash. Lands, 25 placer gold claims and 7 copper claims on the Nizina river, a tributary of the Copper river, Alaska, showing native copper. Property may prove valuable, if properly developed, but was lied about shamefully in the advertisements of its fiscal agents, when peddling stock.

N'KANDHLA SYNDICATE, LTD.

ZULULAND.

Offices: 1, Great Winchester St., London, E. C., Eng. A. Lee, secretary. Organized March 13, 1902, with capitalization £2,000, shares £1 par; issued, £1,800. Property is prospecting rights over 4 blocks, each 600 yards square, on the Umhlatuzi river, N'Kandhla district, Zululand.

NOBLE MINING & MILLING CO.

MONTANA.

Mine office: Sheridan, Madison Co., Mont. S. Kennard, president; J. H. Wyeth, secretary; D. H. Noble, manager. Mine is developed by tunnel and

produces ores carrying gold, silver, lead and copper values. Has steam power, concentrator and 10-stamp mill and plans adding a cyanide plant. Employs about 20 men.

NOGALES COPPER CO.

ARIZONA & MEXICO.

Reorganized, 1904, as Black Mountain Mining Co.

NOME-MONTANA-NEW MEXICO MINING CO.

Office: 415 Iron Bldg., Milwaukee, Wis. Jas. M. Kerr, president. Claimed in advertisements to have gold property at Nome, Alaska, copper claims adjoining the Copper Cliff mine in Montana, and 60 acres of copper lands in the Bromide district of Rio Arriba county, New Mexico. Regarded with much suspicion.

NONESUCH MINE.

MICHIGAN.

Office: care of Arthur K. Camp, 78 Prospect Ave., Milwaukee, Wis. A. K. Camp and M. P. O'Brien owners. Is the pioneer and principal mine of the Porcupine Mountain district of Ontonagon county, Michigan. Lands, 640 acres. Total production, 182 tons, 1,072 pounds of refined copper. Mine carries native copper freely in an argillaceous conglomerate-sandstone. Idle for many years. Very fully described in Vol. II.

SOCIEDAD FRANCESCA DE MINAS y

ARGENTINA.

FUNDICION DE NONOGASTA.

Mine office: Nonogasta, Rioja, Argentina. Property includes the Andueza, Santo Toribio and other mines producing gold, silver and copper, the ores of the Andueza averaging 5% to 7% copper, 30 oz. silver and 2 oz. gold per ton. Has steam power and small smelter, employing about 200 men.

NORMANBY SYNDICATE.

AUSTRALIA.

Mine office: Mt. Perry, Tenningering, Queensland, Australia. Lands, 240 acres, freehold. Vein is parallel to that of the Mt. Perry mine, with similar geological conditions, and is opened to a depth of about 200'. Ore, averaging about 13% copper and 10 to 15 dwts. gold per ton, is sent to the Aldershot smelter for reduction. Employs 30 to 40 men.

NORMANTON-CLONCURRY RAILWAY &

AUSTRALIA.

COPPER MINES, LTD.

Title changed, 1902, to North Queensland Railway Co., Ltd.

NORSK-BELGISK MINEKOMPANI.

NORWAY.

Mine office: Melhus, Flaa sogn, Norway. Is in the Røros district and was working a fahlband, in a small way, at last accounts.

NORTH AMERICAN EXPLOITATION CO.

ARIZONA.

Office: care of Western Trust & Guaranty Co., New York Life Bldg., Chicago, Ills. Has leased the mines of the Mormon Girl Mining Co. and Bradshaw Mining Co., of Arizona, and the Rambler Mining & Smelting Co., of Wyoming, and plans developing same vigorously.

NORTH AMERICAN EXPLORATION CO.

ARIZONA.

Mine office: Gilbert, Yavapai Co., Ariz. Geo. W. Middleton, superintendent. Ores carry gold and copper. Has gasoline power.

NORTH AMERICAN MINING CO.

NEW MEXICO.

Office: 615 Commercial St., Shamokin, Pa. Mine office: Lordsburg,

Grant Co., N. M. Employs 8 men. Thos. A. Lister, president and general manager; W. P. Caldwell, secretary; Daniel W. Briel, superintendent. Organized under laws of New Mexico, with capitalization \$1,200,000, shares \$2 par. Lands, 9 claims, area 155 acres, in the Virginia district, said by company to show fissure veins in porphyry carrying oxide, carbonate and sulphide ores giving assays of 18% copper, 15 oz. silver and \$10 gold per ton. Ore bodies are stated by another party, not connected with company, to be basaltic flows carrying flakes of native copper in absolutely unpayable percentages. Main shaft is 210', on the Cobra Negra property. Has steam power, necessary mine buildings and 4 dwellings, with railroad 4 miles distant.

NORTH AMERICAN MINING CO.

OREGON.

Office: Des Moines, Ia. Mine office: Burkemont, Ore. Organized 1898, with capitalization \$1,500,000, shares \$1 par. Thos. Burke, president and general manager; S. S. Cole, secretary and treasurer. Mineral lands, 807 acres, also 920 acres miscellaneous lands, in the Burkemont district. Main shaft, 300'. Company makes the palpably false claim in its advertisement that its copper ledge is 1,000' wide and over a mile long, giving assays of 6% to 8% copper, with gold and silver values. Management apparently composed of men of fair standing, for which reason it is charitable to suppose that they do not know any better than to put out such glaring misstatements.

NORTH AMERICAN PROSPECTING &

COLORADO.

MINING ASSOCIATION.

Office: 405 Temple Court Bldg., Denver, Colo. Mine office: White Pine, Gunnison Co., Colo. Chris. C. Sierk, president and general manager; Jas. T. Chase, secretary; Daniel C. Tobin, superintendent. Lands, 60 acres, showing 7 contact veins between limestone and shale giving average assays of 2% copper, 25% lead and 20% zinc, from carbonate and sulphide ores. Has water power and small concentrator, making 55% zinc concentrates and 55% lead concentrates carrying copper and gold values.

**NORTH ARKANSAS ZINC, LEAD, COPPER, ARIZONA, ARKANSAS
SILVER & GOLD MINING CO. & CALIFORNIA.**

Office: 380 Wilcox Bldg., Los Angeles, Cal. Idle. J. M. Graybill, president and general manager; M. H. Wells, secretary; J. H. Arbuckle, superintendent. Organized 1902, with capitalization \$5,000,000, shares \$1 par. Is commonly known as the Five Metals Co. Lands, 25 claims, area 500 acres, 18 miles east of Randsburg, in the Spangler district of San Bernardino county, California; sundry claims near Morristown, Maricopa county, Arizona, and 800 acres of undeveloped zinc lands near Mt. House, Baxter county, Arkansas.

NORTH BUTTE MINING CO.

MONTANA.

Office: Duluth, Minn. Mine office: Butte, Silver Bow Co., Mont. Organized April, 1905, under laws of Minnesota, with capitalization \$9,000,000, shares \$15 par; issued, \$6,000,000. Capt. James Hoatson, president; Chas. A. Duncan, vice-president; Jos. B. Cotton, second vice-president and solicitor; Fredk. K. Kennedy, secretary; Louis W. Powell, assistant secretary; preceding officers, Thos. F. Cole, Danl. M. Clemson, Jas. Gayley, Wm. J. Olcott

and John Uno Sebenius, directors. Property is the lands formerly held by the Speculator Mining Co. and sundry adjoining claims.

NORTH CAROLINA MINE.**NORTH CAROLINA.**

Owned by Fentress Mining Co.

NORTH CAROLINA MINING CO.**NORTH CAROLINA.**

Property is the Everett mine, in the Smoky Mountains, Swain county, North Carolina, extensively opened by tunnels. W. S. Adams, general manager. Ore is mainly chalcopryite, with some melaconite and a little native copper, said to average about 6% in copper. Has a good power plant, with boilers, pumps, 4-drill Rand air compressor, etc., and a number of good buildings. Lands include a good smelter site, and a fine water power is available for development. Company is in litigation and property idle. Mine was managed by Ricketts & Banks before becoming involved in legal difficulties.

NORTH CAROLINA & VIRGINIA DEVELOPMENT CO.**NORTH CAROLINA & VIRGINIA.**

Mine office: Virgilina, Halifax Co., Virginia.

NORTH CROWN LYELL MINE.**TASMANIA.**

Lands sold to Mt. Lyell Mining & Railway Co., Ltd.

NORTH FORK COPPER MINING CO.**WYOMING.**

Mine office: Battle, Carbon Co., Wyo. Stuart Edgar, superintendent.

NORTH MOUNT LYELL COPPER CO., LTD.**TASMANIA.**

Absorbed, 1903, by Mt. Lyell Mining & Railway Co., Ltd.

NORTH PACIFIC MINE.**MONTANA.**

Owned by Daly Mining Co.

NORTH PACIFIC MINING CO.**OREGON.**

Office: 29 Hinckley Blk., Seattle, Wash. Property is the Virginia group, in the Cascade Mountains, eastern Oregon. Has a 30-stamp mill.

NORTH PLATTE COPPER MINING & SMELTING CO.**WYOMING.**

Letter returned unclaimed from former mine office, Douglas, Wyo.

NORTH POLE MINING CO.**COLORADO.**

Mine office: Crystal, Gunnison Co., Colo. Organized 1902, with capitalization \$500,000. Controlled by Porter Nelson and James Stewart, of Aspen, Colo., and Boston parties. A carload of ore smelted assayed 10.8% copper, 4.8% lead and 13.8 oz. silver per ton. Was developing at last accounts, with fair prospects.

NORTH QUEENSLAND RAILWAY CO., LTD.**AUSTRALIA.**

Offices: 16, St. Helen's Place, London, E. C., Eng. Organized May 2, 1901, as Normanton-Cloncurry Railway & Copper Mines, Ltd.; name changed to present title July, 1902. Capitalization £50,000, shares £1 par; issued, £33. Property is the idea of building a railway carrying extensive mineral rights, in North Queensland, Australia.

NORTH STAR GOLD & COPPER MINING CO.**NORTH CAROLINA.**

Mine office: Jamestown, Guilford Co., N. C. Jas. Palmer, superintendent. Ores carry gold and copper. Has steam and water power, 20-stamp mill and 50-ton concentrator. Employed 35 to 50 men at last accounts.

NORTH STAR MINING CO.**MICHIGAN.**

Office and mine: 420 East McLeod Ave., Ironwood, Gogebic Co., Mich. Peter Lofberg, president; Adolf W. Peterson, secretary. Organized May 1, 1903, under laws of Michigan, with capitalization \$25,000, shares \$25 par. Lands, 240 acres, held under option, showing several cupriferous amygdaloids, on which a 60' exploring shaft was sunk and crosscuts started. Company plans continuing development work during 1905.

NORTH STAR MINING CO.**WASHINGTON.**

Office: 502 Mutual Life Bldg., Seattle, Wash. Mine office: Index, Snohomish Co., Wash. Organized 1901, under laws of Washington, with capitalization \$1,500,000, shares \$1 par. J. F. Ronald, president; J. S. Chase, secretary; Edw. Ellis, general manager. Lands, 70 claims, area 1,200 acres, lying between the Ethel and Bunker Hill-Sullivan properties, showing a 4' vein, opened by tunnels of 200' and 600', with about 2,000' of underground openings, said to give average values of 10% copper, from bornite and chalcopyrite. Company acquired the Red Mountain group, in Chelan county, in 1904.

NORTH STAR MINING & MILLING CO.**COLORADO.**

Property sold to Silverton Mining Co.

NORTH STATE MINE.**NORTH CAROLINA.**

An old and idle property near Jamestown, Guilford Co., N. C. Vein runs 2' to 25' wide, carrying auriferous sulphide ores. Mine is about 400' deep and has a 20-stamp mill.

NORTH VERDE COPPER CO.**ARIZONA.**

Mine office: Jerome, Yavapai Co., Ariz. J. F. Mowles, superintendent. Has a 65' shaft, planned to be sunk 500'.

NORTH WISCONSIN COPPER MINING CO.**WISCONSIN.**

Dead.

NORTHERN CALIFORNIA INVESTMENT CO.**CALIFORNIA.**

Owns the Black Diamond group, in the Stillwater district of Shasta Co., Cal. Geo. Bayha, vice-president and general manager. Has large holdings, on which several low-grade ore bodies of considerable size have been located.

NORTHERN COPPER (B. S. A.) CO., LTD.**RHODESIA.**

Offices: Salisbury House, London, E. C., Eng. Mine office: Bulawayo, Rhodesia, South Africa. Lord Gifford, V. C., chairman; Bechuana Land Exploration Co., Ltd., managers in South Africa; Thos. D. Davey, resident engineer; Tom Donald, secretary. Registered Feb. 16, 1895, under name of Northern Territories (B. S. A.) Exploring Co., Ltd., changed June, 1899, to present title. Capitalization £250,000, shares £1 par; issued, £160,000. Debentures, £100,000 at 6%, issued 1903, redeemable at £105, December, 1908, and convertible, when fully paid, into £10 shares on one month's notice in writing. Lands originally were 500 square miles, near the Zambesi river, also 12,000 acres of coal lands and 220 gold claims in the Umniati and Guay districts, but 500 square miles were sold to the Rhodesia Copper Co., leaving 5 blocks of 10 square miles each, on either side of the northern reach of the

Kafue river, scattered over an area of 160 miles east and west by 100 miles north and south. Lands include the Silver King, North Star, Maurice Gifford, True Blue, Wonder Rocks, Sable Antelope, Crystal Jacket, Blue Jacket, Bob, Lou-Lou, Sugar Loaf, Lishambika, Inyarka, Kwemba, and Beehive, in the main concession, also the Chanobi concession of 10 square miles, southeast of the main concession. The principal copper deposits so far located are at and near sundry ancient workings, located in a belt of limestone, about 10 miles wide, running nearly north and south for almost the entire length of the concession. The limestone belt is flanked and sometimes intruded by talcose, quartzose and micaceous schists, and by granite, feldspar and quartz-porphyrries, the copper occurring as irregular deposits in limestone and in veins traversing schists, with oxidation at surface, the predominant ores being tetrahedrite and chalcocite, with occasional bornite and chalcopyrite, the ores in schists being more highly oxidized than those in limestone. The company has secured ores in greater or less quantities ranging from 2.5% to 50% copper tenor, and also has quite promising ores of lead and zinc, sundry well-appearing gold claims and a 12" to 24" seam of bituminous coal, with indications of larger and better grade coal measures.

Pending the completion of a railroad into the district, work has been concentrated on the Silver King, Sable Antelope and Chanobi mines. The Silver King mine apparently is the most important, and the company's principal camp is situated in south latitude $14^{\circ} 36' 11''$ and east longitude $26^{\circ} 55'$, 12 miles south of the northerly reach of the Kafue river. The main shaft of the Silver King is 185' deep.

The Chanobi mine, 45 miles from the Silver King, has 5 shafts on 4 separate outcrops. No. 1 shaft is 100'; No. 2 outcrop has a north shaft of 92' and a south shaft of 98', latter showing favorable copper values at bottom; No. 3 outcrop has a 78' shaft showing chalcopyrite and occasional chalcocite; No. 4 outcrop shows copper carbonates on surface. The Chanobi has a warehouse and compound for native workmen.

The True Blue mine has steam power and pump. The Sugar Loaf mine has an immense ore outcrop standing 120' high and a tunnel showing a considerable body of low-grade copper ore. The Sable Antelope mine has three shafts showing a 20' vein of high-grade chalcopyrite on the 50' level. No. 3 shaft of the Blue Jacket mine, 138' deep, shows carbonate ores and chalcopyrite. The Broken Hill mine shows promising outcrops of lead and zinc ores.

Transportation to nearest railroad is by traction engines, and a 600' aerial tramway to span the gorge below the falls of the Zambesi river will permit transshipment of goods, and supplies also can be ferried across the river above the falls. The railroad is to reach the Kafue river eventually, and probably will touch the mines. Mr. Davey, in personal charge of the mines, is a diplomat as well as a competent engineer, and has secured the confidence and good will of the natives, which counts for much in the interior of darkest Africa. The company is developing a considerable amount of ore and can begin smelter shipments at any time considered advisable, but much

the best plan to follow would be to continue development without attempting production, until such time as full railroad facilities are secured, even though this might necessitate the issue of further bonds or an increase in capitalization and this, apparently, is the company's program. The management is good and the properties are decidedly promising.

**NORTHERN TERRITORIES MINING
& SMELTING CO., LTD.**

AUSTRALIA.

Office: Broad Street House, London, E. C., Eng. John MacDonald, chairman; H. Roberts, manager; Herbert Simpson, secretary. Registered Dec. 19, 1902, as a reconstruction of the Northern Territories Gold Fields of Australia, Ltd., with capitalization £175,000, shares 10s. par; issued, 303,370 shares, 6s. paid in. Lands, 604 acres, 113 miles by rail from Port Darwin, in the Northern Territories of South Australia. Has ores of copper, gold and silver, with a 40-stamp mill at the Howley mine, a 20-stamp mill at Yam Creek and a 20-stamp mill at Brock's Creek. Copper properties are known as the Mount Ellison and Iron Blow mines, former opened by a 143' shaft, giving assays up to 12% copper and being very wet. The Iron Blow main shaft, 196', has a mining plant including air-compressor and ore bins for shipping, also a smelter 1 mile distant, with tramway connecting. The smelter has 2 reverberatory furnaces, and a converter on the ground, but not erected. The smelter was blown in during 1904, and in September treated an average of 66 tons of ore daily, producing 204 long tons of matte carrying 61 tons refined copper, circa 17,500 oz. silver and 350 oz. gold. The company is in debt, with rather pressing obligations, and the issue of £50,000 debentures is contemplated. Chairman MacDonald visited the property personally at the close of 1904, and reports that cost of equipment and opening has been greatly underestimated, and quantity and quality of ore reserves greatly overestimated. Legal proceedings against Manager Roberts are said to be contemplated.

NORTHPORT SMELTING & REFINING CO., LTD. BRITISH COLUMBIA.

Controlled and operated by Le Roi Mining Co., Ltd., which see, for description.

NORTHWEST COPPER CO.

BRITISH COLUMBIA.

Office: 11 Broadway, New York. Operated the Van Anda mine for a few months, 1901-1902.

NORTHWEST GOLD & COPPER CO.

OREGON.

Mine office: Sumpter, Baker Co., Ore. Asserted to have a 40' copper vein on the Colorado claim, in the Cracker Creek district.

NORTHWEST MINING CO.

WASHINGTON.

Letter returned unclaimed from former mine office, Kettle Falls, Stevens Co., Wash.

NORTHWEST SMELTING & REFINING CO.

BRITISH COLUMBIA.

Smelter, at Crofton, B. C., now held by Northwest Smelting Co.

**NORTHWESTERN CONSOLIDATED LUMBER,
OIL & COPPER CO.**

OREGON.

Office: care of Glenn M. Deuell, secretary, Grand Rapids, Mich. Dr. O.

A. Lacrone, president and general manager, Kalamazoo, Mich. Supposed to have lands in vicinity of Baker City, Oregon.

NORTHWESTERN COPPER MINING CO.**WYOMING.**

Office: 509 New York Life Bldg., Omaha, Neb. Mine office: Dillon, Carbon Co., Wyo. Employs 10 men. Organized 1902, under laws of Wyoming, with capitalization \$100,000, shares 10 cents par. Chas. R. Courtney, president; W. D. Reed, vice-president; F. E. Brown, secretary and general manager; N. A. Kuhn, treasurer; H. H. Roberts, secretary. Lands, 15 claims, area 300 acres, in the Battle Lake district, about 1 mile west of the Ferris-Haggarty, giving about one mile strike of a vein of 10' to 20' width, apparently the continuation of the Ferris-Haggarty vein, that carries oxide, carbonate and sulphide ores, mainly the latter, assaying 3% to 40% copper and \$2 to \$20 gold per ton. Has about 1,000' of underground openings. Management considered honest and property promising.

NORVELL-PICKRELL COPPER MINING CO.**WYOMING.**

Mine office: Encampment, Carbon Co., Wyo. J. S. Norvell, superintendent.

NORWAY GROUP.**WASHINGTON.**

A group of 9 claims showing a 25' vein opened by tunnel, in the neighborhood of the Bronze Monarch group, on Mount St. Helens, Skamania county, Washington.

NORWAY MOUNTAIN GOLD & COPPER MINING CO.**BRITISH COLUMBIA.**

Office: care of Thomas & Co., fiscal agents, 503 Provident Bldg., Philadelphia, Pa. Agents sold stock on guarantee of dividends within one year, claiming to have copper lands in British Columbia. Apparently a deliberate swindle.

NORWEGIAN COPPER MINES, LTD.**NORWAY.**

Offices: 5, St. Mildred's Court, London, E. C., Eng. Mine office: Goulsasjok, Lyngenfjord, Norway. H. W. Lowe, chairman; H. G. Husen, mine manager; H. P. Smith, secretary. Capitalization £300,000; debentures, £25,000. Property is the Lyngenfjord Kobbervaerk, formerly owned by the Golden Mint Mines, Ltd., having an aerial tram to Kaafjord. Present company moribund.

NORWEGIAN OTTA COPPER CO., LTD.**NORWAY.**

Offices: 371, Mansion House Chambers, London, E. C., Eng. Mine office: Aasoren, Gudbrandsdalen, Norway. S. P. Eastick, managing director; H. Duckworth, secretary. Organized Nov. 1, 1902, with capitalization £100,000, shares £1 par; issued, £75,287. Lands, 5 acres. Presumably idle.

NORWICH MINE.**MICHIGAN.**

Office: care of Alfred Meads & Sons, Marquette, Mich. Lands, including property formerly known as the Trap Rock mine, 840 acres, same distance west of the Ontonagon river, Ontonagon county, Michigan, made 500 tons of copper, 1850-1851; idle since 1865. Has produced masses up to 10 tons in weight and gives a fair showing of stamp rock. Considered the most promising Lake Superior copper property west of the Victoria.

NOTAWAY GOLD & COPPER MINING CO.**COLORADO.**

Office: Mining Exchange Bldg., Denver, Colo. Mine offices: Silverton, San Juan Co., Colo. and Central City, Gilpin Co., Colo. A. J. Vivian, president and general manager; Wm. Gelder, secretary. Capitalization \$1,000,000. Lands, 2 groups of claims, one in Gilpin county, and one in San Juan county. Gilpin county group has ores carrying gold, silver and copper, and is equipped with steam power plant. San Juan county group, on Sultan Mountain, is developed by a 400' tunnel, with considerable underground openings, and has electric power.

NOVARRA MINE.**ITALY.**

An old and small mine, in the province of Piedmont, Italy.

SOCIEDAD NUESTRA SEÑORA DE LA SALUD.**SPAIN.**

Office: Sevilla, Spain. Mine office: Chaparrita, por Rio Tinto, Huelva, Spain. Don Manuel Piérola y Orozco, manager. Lands, 11 mines, area 106 hectareas. Secures a small production of cement copper from leachings of terreros.

COMPañA LOS NUEVES.**SPAIN.**

Letter returned unclaimed from former general offices, San Andres, 26, Madrid, Spain. Mine office: Tijola, Almeria, Spain. Idle.

NUMBER 7 MINING CO., LTD.**BRITISH COLUMBIA.**

Mine office: Greenwood, B. C. Organized 1900, with capitalization \$1,000,000, shares \$5 par. C. E. Laidlaw, president; R. H. Eggleston, secretary; Frederick Keffer, general manager. Lands, sundry well-located claims adjoining the mines of the British Columbia Copper Co., opened by 300' main shaft, with about 2,000' of underground openings. Ores carry values in gold, silver, lead and zinc, with probabilities of copper values at a little greater depth, in a vein of 18" to 7' width, with quartz gangue.

NYACK MINING CO.**ARIZONA.**

Absorbed by Anita Consolidated Copper Co., now Anita Copper Co.

NYMAGEE COPPER MINING SYNDICATE.**AUSTRALIA.**

Lands sold to Great Cobar Copper Mining Syndicate.

OAK HILL MINE.**CALIFORNIA.**

Office and mine: care of Henry Willey, Cooperstown, Tuolumne Co., Cal. Has a 112' shaft, with a little drifting.

OAK HILL MINE.**NORTH CAROLINA.**

Mine office: High Point, N. C. Said to have a 7' vein, carrying bornite, covellite, and chalcopryite, averaging 18% copper.

OASIS GOLD & COPPER MINING CO.**UTAH.**

Office: care of Joseph A. Jennings, secretary, Salt Lake City, Utah. Organized April, 1904, under laws of Utah, with capitalization \$250,000, shares \$1 par. M. S. Browning, president; John T. White, vice-president; Joseph B. Toronto, treasurer; J. D. Clive, manager. Lands, sundry claims in the Drum district, Juab and Millard counties, Utah, opened by a 185' shaft, showing 6 ore chutes, from which ore assaying 4.3% copper, 10 oz. silver and \$19.20 gold per ton was shipped to Salt Lake smelters in 1904. Erection of a concentrator said to be planned.

OAXACA MINING, MILLING & INVESTMENT CO.**MEXICO.**

Office: Wilmington, Del. Mine office: Oaxaca, Oax., Mex. C. Arthur, manager. Property includes the Esperanza and other mines, carrying ores of gold, silver, copper, lead and zinc. Has water power and 10-stamp mill.

OAXARNA GOLD MINING CO.**IDAHO.**

Owens entire stock issue of the Seager-Coryell Gold & Silver Mining Co., Ltd.

OBIE MINE.**JAPAN.**

Mine office: Nakanosho-mura, Tsu-gori, Bitchu, Japan. T. Sakamoto, owner; K. Ogawa, manager. A very ancient property, showing numerous veins carrying chalcopryite and small quantities of argentiferous galena with quartz gangue, in 2' to 4' veins, traversing clay-slate and granite. Has steam power and a good smelter. Employs about 1,000 men. Production in 1899 was 1,316,745 lbs. fine copper.

CARRILO OCANA.**CHILE.**

Office and mines: Taltal, Antofagasta, Chile. Ramon A. Heredia, and David B. Contreras superintendents. Mines are La Liga, Estrella de Venus and Gyacolda, carrying ores of gold, copper and silver. Has steam power and 4 Chilean mills, employing 60 to 75 men.

MINERAL DE COBRE LOS OCOTES, S. A.**MEXICO.**

Office: Oaxaca, Oax., Mex. Mine office: Ejutla, Oaxaca, Mex. Employs 75 men. Organized Sept. 27, 1904, under laws of Mexico, with capitalization \$300,000, Mexican, shares \$100 par, full-paid. Alfredo Oest, president and general manager; P. M. Zulper, vice-president. Lands, 44 pertenencias, area 110 acres, in the Ejutla district, showing 4 fissure veins, of which one under development averages 6' width, carrying sulphide ores assaying 6.5% copper and 15 oz. silver per ton, with a trace of gold. Has 3 shafts, 2 of 100' each and 1 of 230', with about 1,600' of underground openings, estimated to show 12,000 tons of ore. Has steam, gas and electric power. In 1904 produced 290 tons of concentrates carrying 121,000 lbs. fine copper, and 16,700 oz. silver, reduced at the works of the Teziutlán Copper Co.

OCOTITLÁN MINE.**MEXICO.**

Office: care of Harry S. Church, et al, care of International Bank & Trust Co., Guadalajara, Mex. Property is a partially developed mine, two hours horseback ride west of Talpa, Jalisco, Mexico.

OCTAVIA MINING CO.**WYOMING.**

Mine office: Cambria, Wyo. David Jones, president.

ODDIE MINE.**NORTH CAROLINA.**

Owned and operated by Rowan Copper & Gold Mining Co.

OGOYA MINE.**JAPAN.**

Mine office: Nishio-mura, Nomi-gori, Kaga, Japan. T. Yokoyama, owner and general manager. Discovered 1878. Ore is chalcopryite, associated with tenorite, bornite, azurite, native copper and iron pyrites, with quartz gangue, in numerous veins traversing liparite. Three practically parallel main veins are worked, these ranging 1' to 4' in width, and 500' to 2,000' in length. Management is very progressive, and recently has

installed a modern mining and reduction plant. Has water and electric power and 30-ton smelter, employing about 750 men. Production in 1899 was 1,015,759 lbs. refined copper.

OHIO & ARIZONA COPPER MINING & SMELTING CO.

ARIZONA.

Corporation dissolved.

OHIO & COLORADO SMELTING & REFINING CO.

COLORADO.

Office and works: Salida, Chaffee Co., Colo. Timothy Goodwin, general manager; Samuel James, superintendent. Smelter is rated at 1,000 tons daily capacity and is equipped with steam and electric power and refinery, employing several hundred men.

OHIO COPPER CO.

UTAH.

Office: care of Maj. H. G. Catrow, president and general manager, Miamisburg, Ohio. Mine office: Bingham Canyon, Salt Lake Co., Utah. A. J. Bettles, vice-president; Henry Catrow, secretary and treasurer; W. Zeigler, general superintendent; Henry Varden, mine superintendent. Organized October, 1903, under laws of Utah, with capitalization \$1,000,000. Is operated as a close corporation.

Lands, 14 patented claims, area 120 acres, in the Bingham division of the West Mountain district, bought of the Columbia Copper Co. for \$225,000. The mine has several shallow shafts, deepest 145', showing an 8" streak of melaconite running 25% copper, and 30" of disseminated cuprite averaging 12.5% copper. Also has tunnels of 800' and 1,150', with about 1 mile of underground openings. Principal ore body is a vein carrying disseminated chalcopryrite, said to show about 1,000,000 tons, this being identical with the cupriferous porphyry now being handled successfully by the Utah Copper Co. Shipping ore averages 12%, with small gold and silver values, but the amount of shipping ore shown is small compared with the enormous tonnage of low-grade ore averaging about 2% in copper tenor. The mine is operated through an 800' main crosscut tunnel, which intersects the What Cheer and All's Well parallel veins, 400' apart. The All's Well vein shows a 6' pay-streak of 5% copper with small gold values, and the winze on the What Cheer vein shows 7' of rich sulphides. The property has an old 5-stamp mill and 20-ton concentrator, and the Winnimuck mill was bought for \$50,000 in 1904 and enlarged to 125 tons daily capacity. The mill is putting about 5 into 1, and it is planned to enlarge it to 200 tons, and eventually to 700 tons daily capacity. Production, in January, 1905, was at the rate of about 150 tons fine copper monthly.

OHIO MINE.

ARIZONA.

Office and mine: care of Louis Krockel, Metcalf, Graham Co., Ariz. A new and partially developed property of considerable promise, said to show 60' of ore, assaying up to 20% copper.

OHIO MINING & MILLING CO.

COLORADO.

Mine office: Montezuma, Summit Co., Colo. R. T. Williams, superintendent. Ores carry gold, silver and copper. Has steam power and small concentrator, employing about 25 men at last accounts.

OJANCOS MINING CO.**CHILE.**

Controlled by Messrs. Gibbs & Co. Operates the Transito and Andocollo mines, in the Ojancos district of Chile, these being important properties and considerable producers.

O. K. EXTENSION MINING & REDUCTION CO.**UTAH.**

Office: 40 Commercial Blk., Salt Lake City, Utah. Mine office: Blue Acre, Beaver Co., Utah. Organized November, 1899, under laws of Utah, with capitalization \$150,000, shares 50c. par. A. J. McMullen, president and general manager; C. C. Gott, secretary and treasurer. Lands, 21 claims, area 360 acres, also a 20-acre millsite, near the O. K. mine, in the Beaver Lake district, showing two fissure veins of 5' average width, carrying chalcoppyrite assaying 4% copper and 6 oz. silver per ton, with traces of gold, opened by 6 shafts, deepest 510', and a 150' tunnel, with 1,045' of underground openings. Has steam and gasoline power.

O. K. GOLD & COPPER MINING CO.**ARIZONA.**

Office: Lyndon, Kansas. Mine office: Florence, Pinal Co., Ariz. Employs 4 men. W. L. Newcomer, president; S. B. Johnson, secretary; J. Banning, treasurer and general manager; Abe Johnson, superintendent; W. B. Banning, engineer. Organized 1902, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Lands, 15 claims, area 300 acres, in the Picacho district, showing numerous veins of which two, averaging 3' width, are being developed by 6 shallow shafts, deepest 120', and 4 tunnels, longest 125', showing oxide, carbonate and sulphide ores, giving assays up to 20% copper, with traces of gold and silver.

VERWALTUNG DER KÖNIGLICHE PREUSSISCHEN- UND GERMANY.**HERZOGICHE BRAUNSCHWEIG'SCHE KOM-
MUNION HÜTTEN-STAATSWERKE OKER.**

Is the smelting plant of the Rammelsberg mine, which see, for description.

OKUZU MINE.**JAPAN.**

Mine office: Okusu-mura, Kita-Akita-gori, Ugo, Japan. Is a silver mine, near Hanawa, making a trivial amount of copper as a by-product

OLALLA COPPER MINING & SMELTING CO. BRITISH COLUMBIA.

Office: 206 Temple Court Bldg., New York. Mine office: Olalla, B. C. Robert Gaede, president; Nathan Mintz, secretary and treasurer; W. C. McDougall, general manager. Organized October, 1901, under laws of Maine, with capitalization \$8,000,000, shares \$25 par. Also controls the Similkameen & Keremos Ry. Co., capitalized at \$3,000,000. Lands, 61 crown-granted claims, also mill and smelter-site of 100 acres, total area about 2,500 acres, in the lower Similkameen and Keremos camps, Osoyoos division of the Yale district, showing contact veins between diorite and felsite, ore bodies occurring in both formations but mainly in the felsite. Veins, about a dozen in number, are said by company to range in width from 3' to 500' and are estimated by company to average about 5% copper, 2 to 5 oz. silver and \$1 to \$40 gold per ton, but this estimate probably is

considerably too high. Gangue is spar, garnetite and magnetite. Development includes a 30' shaft and tunnels of 50', 250' and 600'. Property has hand power only, and is 87 miles from a railroad, 60 miles of which has steamer transportation. Company planned installation of a smelter in 1904, but did not build it, and estimates that it can mine and smelt the bulk of its ore at a cost not exceeding \$2.50 per ton. This can be done, however, only by operating on a very large scale. Ore bodies are decidedly low grade, but apparently are extensive, and the ore is self-fluxing. Employs a small force only, on development work.

OLD BALDY GOLD MINING & TUNNEL CO.

NEW MEXICO.

Mine office: Elizabethtown, Colfax Co., N. M. Thos. C. Sewall, superintendent. Ores carry gold and copper. Has gasoline and electric power.

OLD BALDY MINE.

ARIZONA.

Mine office: Tucson, Pima Co., Ariz. W. B. McCleary, superintendent. Ores carry gold and copper. Has steam power.

OLD BOOT MINE.

ARIZONA.

Owned by Imperial Copper Co.

OLD CATAWBA MINE.

UTAH.

Office: care of Judge Theo. Botkin, president and general manager, Salt Lake City, Utah. Property is a promising group of 7 claims, near Milord, Beaver county, Utah.

OLD COLONY COPPER CO.

MICHIGAN.

Office: 60 State St., Boston, Mass. Mine office: Calumet, Houghton Co., Mich. Employs 12 to 15 men. Organized 1898, under laws of Michigan, with capitalization \$2,500,000, shares \$25 par, \$12 paid in. Annual meeting, second Wednesday in December. H. F. Fay, president; Geo. G. Endicott, secretary and treasurer; James Chynoweth, superintendent; preceding officers, John C. Watson, Wm. Howell Reed, Rogers L. Barstow and Stephen R. Dow, directors. Expenditures for year ending Oct. 30, 1904, were \$27,000, leaving on hand a balance of \$45,611.85.

Lands, 1,200 acres, in Sections 17 and 18, T. 56 N., R. 32 W., east of and adjoining the Calumet & Hecla. A complete geological cross-section has been secured by tunnel, driven, 1899-1901, from the Eastern Sandstone, 57° west of north, for about 3,000', at right angles to the formation, which has a strike of No. 33° E., and by diamond drill borings from the Kearsarge amygdaloid eastward to the western end of the tunnel. This work shows upwards of 75 well-defined amygdaloid and conglomerate beds, a number of which showed some copper in the drill cores. There are 5 shafts, No. 1 being 400' deep; No. 2, 250'; No. 3, 550'; No. 4, 100'; and No. 5, 200'. During 1904 openings of 736' were made. At the close of the year, work was being done on a crosscut to reach a lode lying about 2,000' east of the Kearsarge amygdaloid.

OLD DOMINION COMPANY.

ARIZONA.

Office: 99 John St., New York. Jas. Douglas, president; Chas. Sumner Smith, vice-president; Chas. H. Altmiller, secretary and treasurer. Organized Dec. 22, 1903, under laws of Maine, with capitalization \$8,750,000.

shares \$25 par. Is a securities holding corporation only, formed to promote the operation of the Old Dominion Copper Mining & Smelting Co. and the United Globe Mine under a joint management, while technically complying with injunctions restraining the merging of these two corporations. The Old Dominion Co. controls the operations of both subsidiary corporations, through ownership of majority share interests. The United Globe Mine gave 138,000 shares of its stock and \$250,000 cash for 138,000 shares of the Old Dominion Co., which has 150,000 shares of its stock for exchange on an even basis for shares of the Old Dominion Copper Mining & Smelting Co., the latter corporation having an issued capital of 150,000 shares. More than 100,000 shares of Old Dominion Copper Mining & Smelting Company stock, or upwards of two-thirds of the outstanding issue, have been exchanged for shares of the Old Dominion Co.

The plans of the Old Dominion Company, which controls the operations of the Old Dominion Copper Mining & Smelting Co. and the United Globe Mine, provide for the working of both mines as entities, but with free interchange, upon an equitable basis, of ores needed for fluxing. The Old Dominion Co. also financed the pressing floating indebtedness of the Old Dominion Copper Mining & Smelting Co., by means of loans, which are being repaid from earnings, the balance, at the close of 1904, being estimated at about \$300,000.

OLD DOMINION COPPER MINING & SMELTING CO.

ARIZONA.

Office; 35 Congress St., Boston, Mass. Mine office: Globe, Gila Co. Ariz. Employs about 500 men. Organized July, 1895, under laws of New Jersey, with capitalization \$5,000,000, shares \$25 par; issued \$3,750,000. Annual meeting, first Wednesday in April. Chas. Sumner Smith, president; Chas. H. Altmiller, secretary and treasurer; Chas. S. Smith, Geo. Napier Towle, Dr. Jos. T. Herrick, Chas. T. Lund, Fred W. Hoar, E. F. Newton and G. Waldo Smith, directors, three first named constituting an executive committee; Dr. L. D. Ricketts, consulting engineer and acting manager; Niles S. Berray, general superintendent; C. F. Shelby, smelter superintendent; Peter Hutton, assistant smelter superintendent. Lands, 6 full and 3 fractional claims, at Globe, with a 10-acre millsite adjoining, also the Old Dominion and Keystone claims north of Globe, the Continental group of 240 acres and the Chicago & New York group of 60 acres, latter groups being unconnected with the principal tract. The principal ore zone occurs along a displacement having a northeast and southwest strike, with sharp dip to the southeast. The hanging wall is limestone and quartzite, with a diabase of more recent age as footwall. Faulting evidently occurred both before and after the intrusion of the diabase. Ore favors the hanging wall, occurring in lenses parallel to the bedding planes of the limestone and quartzite, the largest lense yet developed being about 60x100x200' in size. The ores carried comprise a considerable variety of forms, including oxides, carbonates, sulphides and chrysocolla. The oxidized ores are mainly cuprite, associated with a little malachite and chrysocolla, in a gangue of iron oxides and quartz. Sulphides first appear at a depth of about 350', the principal sulphide ore

being chalcocite with gangue of iron pyrites and quartz, with a little 3% to 4% chalcopyrite in the lower workings. All ores are more or less argenterous, and as a rule are highly silicious, requiring heavy iron and lime fluxes in smelting.

The new main working shaft, 852' deep, has 4 compartments with steel gallows-frame and 24x60" direct-acting hoist handling double-deck cages in counterbalance. A 1,500-gallon Prescott pump has been installed on the tenth level of the new shaft, with a 12" water column rising 30' above the collar of the shaft and discharging into a launder on a trestle leading to a storage tank, whence water is drawn off for use of the mill and smelter. The engine-house and boiler-house at the new shaft are of steel frame, with iron sides and roofs. Machinery equipment includes a Nordberg cross-compound air compressor with water-jacketed air cylinders and intercooler, having a capacity of 2,000 cubic feet of free air per minute, and rated at 30 drills. There also is a complete electric light plant, and petroleum is used exclusively for fuel at the power plant. A large and well-built machine shop is nearing completion, this being an important factor in the success of a mine located some hundreds of miles from the nearest shop doing general work.

Ores will be graded and furnace charges prepared at the new millsite, a short distance from the mine. The grading plant has 6 steel bins of 85 tons capacity each, for coarse ore, with a conveying belt passing beneath. Ore is drawn from the various pockets onto trammels of manganese steel, undersize from which drops to an 18" conveying belt that carries it to railroad storage bins, while the oversize goes to a 10x20" crusher and thence to a 36" picking-belt, from which the smelting ore is hand-picked and the residue run through a 10x20" rock-breaker crushing to 2" size, the material from the last crusher being taken on an 18" belt to the concentrator storage bins. The concentrator, of steel frame with iron covering, is being built from the plans of Dr. Ricketts, and should go into commission early in 1905. Handling of material will be as nearly automatic as possible throughout, and the mill will have a daily capacity of 300 tons. Mine, mill and smelter are connected by a private railway equipped with a 14x20" Porter locomotive and 50-ton ore cars.

The old smelter has been remodeled past recognition, and now is a thoroughly modern and efficient plant, with steel frame on stone foundations, and corrugated iron roof. The smelter has 8 double storage-bins, holding 1,000 tons of ore, limestone and coke. There are 3 blast furnaces, each 44x180" at the tuyeres, arranged tandem with common settlers between. These are rated at only 400 tons each, but two were blown in during October, 1904, and are treating an average of about 425 tons each daily, giving the completed plant a capacity of about 1,300 tons. Furnaces are charged automatically from side-dumping cars, and water for the jackets is brought from the mine, as previously described. The power plant at the smelter has two 200-h. p. and two 325-h. p. boilers, burning petroleum. Available furnace blast is 45,000 cubic feet per minute. An electric generator furnishes

power for lighting, traction and crane. The dust-chamber, of brick, is 20x20x250', connecting with a smoke-stack 200' high, 23' diameter at base and 14' diameter at top, with base 25' above the tuyeres. Flue-dust is briquetted for resmelting. The plant has an electric locomotive with three 1½-ton ore cars of tilting pattern, also a small steam locomotive and cars, for handling slags.

The converter department has two stands, and a third being installed. Shells are 7x11', lined with a mixture of clay and quartzite carrying 4.5% copper, the lining carrying 75% silica and making 18 tons before burned out. Available converter blast is 12,000' per minute, to be increased by 6,000' for the third stand. Shells are handled by a 40-ton electric crane. Product of the furnaces is a 50% matte, and of the converter is 99.5% blister copper carrying small silver values. The smelter buys considerable custom ore and also uses about 100 tons daily of low-grade sulphide ores from Bisbee, for fluxing the highly silicious ores of the Old Dominion.

Production of the Old Dominion was 7,992,550 lbs. fine copper in 1902, and 15,368,147 lbs. in 1904. At the close of 1904 the smelter was making about 2,000,000 lbs. per month, and with the additions now under way at the plant should reach a productive capacity of about 30,000,000 lbs. fine copper yearly. The property is a very valuable one, and is in the best of hands. Protests of shareholders who feared they were to be swallowed by Phelps, Dodge & Co. are no longer heard, and the Old Dominion should be able to pay its first dividend early in 1906, after the present floating debt of about \$300,000 has been cleared off, and a reasonable surplus accumulated.

OLD HANOVER COPPER CO.

NEW MEXICO.

Probably an erroneous title for Hanover Copper Co.

OLD HICKORY COPPER MINING CO.

NEW MEXICO.

Absorbed by Copper Chief Mining Co.

OLD HICKORY MINE.

UTAH.

Owned by Majestic Copper Mining & Smelting Co.

OLD NOLL MINE.

AUSTRALIA.

Mine office: Leighs Creek, South Australia. E. Bernini, manager. Has steam power and employed about 25 men at last accounts.

OLD RELIABLE MINING CO.

NEW MEXICO.

Mine office: Golden, Santa Fé Co., N. M. J. B. Mayo, superintendent. Ores carry gold and copper. Has two 5' Huntington mills. Employs 20 men.

OLD TOWN MINING & MILLING CO.

COLORADO.

Mine office: Russell Gulch, Gilpin Co., Colo. Geo. K. Kimball, Jr., superintendent. Ores carry gold, silver and copper. Has a 900' shaft, is equipped with steam and electric power, and employs about 40 men.

OLYMPIA MINING CO. OF WYOMING.

WYOMING.

Office: 187 E. Chicago Ave., Chicago, Ill. Pehr W. Nillson, president; Herman C. Johnson, secretary; John Lundgren, general manager. Lands are supposed to be in the Encampment district of Carbon county, Wyoming.

OLYMPIC MINING CO.**WASHINGTON.**

Office: 301 Lumber Exchange, Seattle, Wash. E. R. Butterworth, president; Alfred Jeffery, secretary. Company advertises stock on the installment plan, claiming that its lands contain gold, copper and coal, but secretary writes, as an excuse for not furnishing a statement, that the company is not developing a copper mine. Regarded with suspicion.

OMAHA COPPER MINING CO.

Office: 1017 New York Life Bldg., Omaha, Nebraska.

OMAHA GOLD & COPPER MINING & SMELTING CO.**MONTANA.**

Supposed to hold mining claims near Bigtimber, Sweetgrass Co., Mont.

OMAKI MINE.**JAPAN.**

Mine office: Nishitate-mura, Kita-Akita-gori, Ugo, Japan. Opened circa 1750; reopened 1885. Principal value of ore is in argentite, associated with chalcopryrite, galena and sphalerite. Ore bodies are lenses, largest 70' deep by 130' long, in Tertiary tuff and andesite. Production for 1896 was 858,316 momme silver and 242,690 lbs. refined copper.

OMODANI MINE.**JAPAN.**

Mine office: Kami-Anana-mura, Ono-gori, Echigo, Japan. Operated by the Mitsu Bishi Gosshi Kwaisha. Opened circa A. D., 1350. Ores are chalcopryrite, bornite, sphalerite and galena, all argentiferous and carrying occasional native silver. Has numerous veins, none exceeding 4' in width. Production in 1900 was 103,682 momme silver and 614,438 lbs. refined copper.

OMORI MINE.**JAPAN.**

Mine office: Omori-mura, Nima-gori, Iwami, Japan. Opened circa A. D., 1300; reopened 1525. Was once highly productive, but apparently is nearly worked out. Carries auriferous and argentiferous chalcopryrite in the Eikyu group, and malachite, argentite and native silver in the Hontani group. Production in 1900 was 2,880 momme gold, 121,280 momme silver and 80,139 lbs. refined copper.

ONECO COPPER MINING CO.**MICHIGAN.**

Office: 18 P. O. Sq., Boston, Mass. W. F. Fitzgerald, president; S. S. Millett, secretary and treasurer. Organized 1899, under laws of Michigan, with capitalization \$2,500,000, shares \$25 par. Lands, 800 acres, near Hancock, Houghton Co., Mich. Tract, originally known as the Hungarian, and later as the Fitzgerald, has had a limited amount of exploratory work, in 1862 and again in 1899-1900. Has one shaft of about 500', also 8 dwellings and several small mine buildings. Fully described in Vol. II.

ONEIDA GOLD & COPPER CO.**ARIZONA.**

Letter returned unclaimed from Nogales, Santa Cruz Co., Ariz.

ONOKO MINES CO.**COLORADO.**

Office: 203 Kittredge Bldg., Denver, Colo. Mine office: Central City, Gilpin Co., Colo. Organized under laws of Colorado, with capitalization \$1,800,000, shares \$1 par. Samuel L. Morris, president; Edgar T. Butler, secretary and treasurer. Lands, 5 claims, opened by a 229' vertical shaft,

showing a vein with a 12" pay-streak carrying assay values up to 11.95% copper, 3.91 oz. silver and 0.17 oz. gold.

ONTARIO & COLORADO GOLD**ONTARIO & COLORADO.****& COPPER MINING CO.**

Office: 610 Majestic Bldg., Detroit, Mich. Mine office Central City, Gilpin Co., Colo. Dr. J. E. Burgess, president and general manager. Albert H. Roehm, vice-president; Wm. C. Heath, treasurer; C. H. Colburn, secretary and assistant general manager. Capitalization \$1,250,000, shares \$1 par. Has mining claims in Ontario, Yukon and Colorado, former being 65 acres adjoining the Wilcox property, on Spider Lake, Cowper Twp., in the Parry Sound district. Colorado property is the O'Neil mine, near Central City, carrying ores of copper, silver, gold and lead, with steam power and employing about 20 men.

ONTARIO GOLD & COPPER MINING CO.**ARIZONA.**

Office: Prescott, Yavapai Co., Ariz. A. C. Burmister, manager.

ONTARIO SMELTING CO.**ONTARIO.**

Mine office: Massey Station, Algoma, Ont. Has lands said to show auriferous chalcopryrite assaying 3.5% to 6% copper.

O'OKIEP MINE.**CAPE COLONY.**

Owned and operated by Cape Copper Co.

OPAL GOLD MINING CO.**WASHINGTON.**

Mine office: Chesaw, Wash. J. P. Blaine, superintendent. Ores carry gold, silver and copper. Has steam power and employs 10 men.

OPHIR CONSOLIDATED MINES CO.**COLORADO.**

Mine offices: Telluride, San Miguel Co., Colo., and Ames, San Miguel Co., Colo. W. S. Buckley, manager. Ores carry gold, silver, lead and copper, latter secured in small quantities as a by-product. Has electric power, 50-stamp mill and 100-ton cyanide plant, employing about 100 men.

OPHIR COPPER MINING CO.**MONTANA.**

Office: 404-85 Dearborn St., Chicago, Ill. Mine office: Butte, Silver Bow Co., Mont. Employs 50 men, when working. Organized July 25, 1902, under laws of South Dakota, with capitalization \$1,000,000, shares \$1 par, in 550,000 temporary preference shares and 450,000 deferred shares; issued, \$520,000. Edw. Ryan Woodle, president; Samuel W. McMunn, vice-president; Lorene Sheetz, secretary; Matthews S. Bradley, treasurer, Sampson W. Hall, superintendent. Lands, 1 patented claim, area 20 acres, in South Butte, showing 3 veins, of 5', 30' and 50' average width, carrying chalcopryrite and bornite returning 10% to 38% copper, 29 oz. silver and \$2.20 gold per ton, with molybdenite and occasional lead. Has a 256' working shaft and two 50' air shafts, with about 5,000' of underground openings. Principal values are in silver, but copper undoubtedly will predominate at depth. After shipping about 2,000 tons of ore to the East Helena smelter, in 1903, production was suspended, except on the 200' level, pending deepening of shaft 400' with a view to developing copper values. Has a 180-h. p. steam plant, with hoist good for 1,000', a 6-drill Rand air compressor and a 30x40' carpenter and machine shop. The Ophir produced about \$300,000.

net, mainly in silver, prior to 1893. Management considered good and property regarded as promising.

OPHIR GOLD & COPPER MINING CO.

MONTANA.

Office: Spokane, Wash. Property is in the Blackfoot district, near Helena, Lewis & Clarke County, Montana. M. A. Mitchell, superintendent.

OPHIR HILL CONSOLIDATED MINING CO.

UTAH.

Mine office: Ophir, Tooele Co., Utah. Controlled by Senator W. A. Clark, of Montana. E. W. Clarke, superintendent. Ores carry gold, silver, lead, copper and zinc, with values mainly in silver and lead. Has water, steam and electric power, and 150-ton concentrator, employing about 100 men. Is operated as a close corporation, and no information is given out, but mine is known to be rich and profitable.

OPHIR MINING & DEVELOPING CO.

MONTANA.

Claimed in advertisements to have property in Butte, Montana. Probably same as Ophir Copper Mining Co.

OPHIR QUEEN MINING CO.

UTAH.

Office: Cedar River, Mich. Mine office: Ophir, Tooele Co., Utah. Employs 10 to 15 men. Organized Apr. 19, 1902, under laws of Utah, with capitalization \$250,000, shares 25 cents par. Wm. S. Laing, president; Saml. Crawford, secretary, treasurer and general manager. Lands, 4 claims, area 53 acres, in the Ophir district, showing a 25' vein giving assays of 12% copper, 10% lead, 2% to 15% zinc, 18 oz. silver and 40 cents gold per ton, opened by a 335' shaft with two 5x8' compartments, and 3 tunnels, longest 220' and 225'. Has a 40-h. p. gasoline hoist, 3-drill Rand air-compressor and power drills. Management considered honest.

OPTIMO GOLD & COPPER MINING CO.

MONTANA.

Office: Missoula, Mont. Mine office: Saltese, Missoula Co., Mont. C. J. Heidenreich, F. C. Mix and W. H. Yearick, directors. Organized 1904, under laws of Montana, with capitalization \$1,500,000, shares \$1 par.

OQUIRRH-BINGHAM COPPER CO.

WYOMING & UTAH.

Office: 1103-279 Dearborn St., Chicago, Ill. Mine office: Bingham Canyon, Salt Lake Co., Utah. Organized under laws of Wyoming, with capitalization \$1,000,000. H. A. Brown, superintendent. Has lands in Wyoming, with principal holdings in the West Mountain district of Utah, where some good copper carbonates were shown in the upper levels, late in 1904.

ORDENAURA MINING CO.

MEXICO.

Mine office: Velardeña, Durango, Mex. E. K. McCann, manager. Ores carry copper, silver and lead.

ORE KNOB MINE.

NORTH CAROLINA.

Located near New River, Ashe Co., N. C. Was opened before 1860 and closed 1885. Said to have yielded net profits of \$60,302 in 1874. Has a fissure vein of 6' to 20' width, with nearly vertical dip, crossing a formation of micaceous granite and mica-schist, carrying mainly sulphide ores nearly free from gangue and claimed to average 12% to 20% copper, opened by 11 shafts, deepest 400'. Has a 150-ton smelter, built 1902.

OREGON COPPER CO.**OREGON.**

Incorporated February, 1903, by J. F. Culter, et al., of Spokane, Wash.

OREGON GOLD & COPPER CO.**OREGON.**

Incorporated August, 1902, by Anthony Mohr, et al., of Sumpter, Ore.

OREGON HOMESTEAD MINING & REDUCTION CO.**OREGON.**

Office: care of C. J. Allen, president, Portland, Ore. Frank B. Roberts, vice-president and general manager; W. T. Perry, secretary and treasurer. Company organized, 1904, to take over the Allen copper-gold mine, on Rogue river, $3\frac{1}{2}$ miles south of Galice creek, Josephine county, Oregon, at a reported consideration of \$750,000. It is planned to develop power by damming Rogue river, where a considerable water power is available.

OREGON ORE REDUCTION WORKS.

A company organized, 1900, by Letson Balliet, to build a smelter at Portland, Ore. Promoter got into jail before smelter got into existence.

OREGON SHORT LINE MINING CO.**NEVADA.**

Mine office: Picohe, Lincoln Co., Nev. E. F. Freudenthal, superintendent. Ores carry copper, silver and lead.

OREGON SMELTING & REFINING CO.**OREGON.**

Office and works: Sumpter, Baker Co., Ore. Fred D. Fuller, general manager; Chas. Kirchen, superintendent. Property is a 150-ton smelter, blown in September, 1904. Smelter building, 46x88', has a 38x148" matting furnace. Other buildings are a 32x66' briquetting plant, 46x77' boiler-house, 33x37' sampling mill, 16x86' ore bins, and 32x52' laboratory. Plant will do an exclusively custom business, and has considerable tributary territory.

ORFORD COPPER CO.**NEW JERSEY.**

Office: 43 Exchange Pl., New York. Works office: Constable Hook, N. J. Is controlled by the International Nickel Co. and refines nickel matte and ores from New Caledonia and nickel-copper matte from Canada, in addition to treating copper ores and mattes from the United States, Canada, Mexico and elsewhere. Capacity of plant is about 6,000,000 lbs. of copper and 1,000,000 lbs. of metallic nickel monthly. Works are exceptionally well equipped, and this company has a deservedly high reputation for metallurgical ability, and the high grade of its manufactured products.

ORIENT GOLD MINING CO.**WASHINGTON.**

Mine office: Bossburg, Stevens Co., Wash. John Brown, superintendent, at last accounts. Ores carry gold and copper. Has steam power.

ORIENTAL COPPER CO.**ARIZONA.**

Office: care of T. J. Wolfley, secretary and treasurer, care of Globe-Democrat, St. Louis, Mo. Mine office: Cave Creek, Maricopa Co., Ariz. Organized 1904, under laws of Arizona, with capitalization \$2,000,000. N. M. Clemmons, president; A. S. Mills, superintendent. Lands, 11 claims and a millsite, with some development. Company is said to plan development upon a large scale.

ORIENTAL MINING & MILLING CO.**ARIZONA.**

Office: Jamestown, N. Y. Mine office: Providence, Yavapai Co., Ariz.

A. F. Kent, president; W. A. Keeler, secretary; W. A. Kent, assistant treasurer; L. B. Kent, superintendent. Is primarily a gold and silver mine, carrying a small percentage of copper. Has steam power and 20-stamp mill.

ORIENTE DE THARSIS GROUP.

SPAIN.

Mine office: care of Wm. Guthrie Bowie, manager, Alosno, Huelva, Spain. Property is large group of government concessions, including the Huera, showing extensive outcrops, remains of ancient works and some old scoria. Has about 400 metres of underground development, on a 5% ore body of 12½ metres, a 4% ore body of 7 metres and a 3.5% ore body of 5 metres, and a body of cupriferous pyrites has been cut to the northward. Deepest crosscut, about 90 metres below the crest of the hill, is on a level with the Tharsis railway, and ore can be shoveled into the railroad ore-cars.

ORIGINAL CONSOLIDATED MINING CO.

MONTANA.

Office and mine: Butte, Silver Bow Co., Montana. Organized Feb. 20, 1904, under laws of Washington, with capitalization \$10,000,000, shares \$100 par, succeeding the Original Mining Co., organized under laws of Montana, change being made to secure exemption from certain provisions of the Montana law regarded as onerous. Control is owned by Senator Clark. Hon. W. A. Clark, president; A. H. Wethey, vice-president and general manager; Wm. Bickford, secretary; Thos. Bryant, superintendent; Jere Rourke, engineer.

Lands include the Original, West Stewart and East Stewart mines, developed by 1,500' and 1,800' working shafts. Main shaft has a 36x72' duplex first-motion Nordberg hoist and a 126' steel gallows-frame, the highest in the Butte camp. The other shaft also has a new steel gallows-frame and a similar hoist, good for 3,000' depth. The machinery equipment includes 4 steam air compressors and 2 electric air compressors, with an aggregate capacity of 120 power drills. The ore is mainly chalcocite and the mine apparently is improving at depth. The company has an excellent management, and despite the comparatively small area of its mines, is a very valuable and highly productive property.

ORIGINAL MINING CO.

MONTANA.

Succeeded, Feb. 20, 1904, by Original Consolidated Mining Co.

ORIOLE COPPER MINING CO.

WYOMING.

Office and mine: Douglas, Converse Co., Wyo. Hon. C. D. Clark, president and general manager; E. J. Wells, secretary and treasurer; C. J. Wells, manager. Lands, 4 claims and a millsite, with a 155' main shaft bottomed in a 40" vein of carbonate ore giving assays of 30% to 40% copper.

ORION MINING CO.

NEW MEXICO.

Office: P. O. Box 12, El Paso, Texas. Mine office: Lordsburg, Grant Co., N. M. Organized 1898, under laws of New Mexico, with capitalization \$200,000, shares \$1 par. A. W. Gifford, manager; B. W. Randall, superintendent. Property is the Dundee mine, in the Shakespeare district, having about 1,000' of underground openings, said to show 10,000 tons of

ore with quartz gangue carrying \$12 to \$14 per ton in gold, silver and copper, which must be concentrated to afford a profit. Company also owns the Three Friends, Black Hawk and Orion Extra properties, in the Jarilla district of Otero county, New Mexico, which are idle, except for annual assessment work.

SOCIEDAD MINERA EL ORITO.**CHILE.**

Mine office: El Orito, San Felix Vallenar, Chile. Operates Las Breas mines, opened 1888, and also owns the Carmen mine, 190' deep, opened in 1857, now idle. Production, shipped as matte, is equivalent to about 1,500,000 lbs. refined copper yearly.

ORO COBRA MINING CO.**ARIZONA.**

Office: Burlington, Iowa. Letter returned unclaimed from former mine office, Prescott, Arizona. Thomas Wilkinson, president; S. M. Wilkinson, secretary and treasurer; T. C. Archer, general manager. Organized October, 1901, under laws of Arizona, with capitalization \$1,500,000, shares \$1 par. Lands, 17 claims, area 340 acres, also 40-acre millsite, in the Ellsworth and Copper Basin districts, showing numerous small cupriferous veins. Apparently moribund.

ORO DENORO MINE.**BRITISH COLUMBIA.**

Office: Rossland, B. C. Mine office: Eholt, B. C. Employs 10 men. Organized 1903, under laws of British Columbia, with capitalization \$1,500,000, shares \$1 par. Ross Thompson, president; Dr. J. A. L. McAlpine, vice-president; Smith Curtis, secretary, treasurer and managing director; S. L. Graham, mine foreman. Lands, 4 claims, area circa 190 acres, adjoining the British Columbia mine, in the Boundary division of the Yale district, showing 3 wide ore bodies, apparently fissure veins, ranging 20' to 100' in width, carrying auriferous and argentiferous chalcopryite, with a large excess of iron and lime, for which the smelters pay a premium for fluxing use, the actual cost of reduction for 1903 having been 16 cents per ton. Mine is developed by 3 tunnels and a 190' shaft. Production for 1904 was 529,930 lbs. refined copper, 4,657 oz. silver and 684 oz. gold. Management is good and property is regarded as valuable.

ORO GRANDE MINES CO.**ARIZONA.**

Letter returned unclaimed from former office, 1034 Park Row Bldg., New York. Mine office: Wickenburg, Maricopa Co., Ariz. Has upwards of 3,300' of underground openings, showing a large ore body considerably mixed with country rock. Property is regarded as promising, but management is viewed with suspicion.

FRANCISCO RODRIGUEZ OROZCO y CA.**MEXICO.**

Office and mine: Mazapil, Zacatecas, Mexico. Mines are the Todos Santos, La Nieva y Anexas, developed by a 175' main shaft, and a 1,000' main working tunnel. Ores carry copper, lead, silver and gold values, and property has a 75-ton smelter. Employ about 150 men.

ORTONA MINE.**AUSTRALIA.**

Office: care of A. Linedale, owner, Irvinebank, Queensland, Australia.

Mine office: Percyville, Queensland, Australia. Has limited development only.

ORVILLE GOLD & COPPER MINE CO. BRITISH COLUMBIA.

Mine office: Golden, B. C. Idle at last accounts.

OSAKA ELECTROLYTIC REFINING CO. JAPAN.

Office and works: Osaka, Japan.

OSARUZAWA MINE. JAPAN.

Owned and operated by the Mitsu Bishi Gosschi Kwaisha.

OSCEOLA CONSOLIDATED MINING CO. MICHIGAN.

Office: 199 Washington St., Boston, Mass. Mine office: Opechee, Houghton Co., Mich. Organized 1873 and reincorporated 1903, under laws of Michigan, with capitalization \$2,500,000, shares \$25 par; issued, \$2,404,250. Has paid dividends of \$4,631,900 to close of 1904, and has declared a dividend of \$2, payable January, 1905. Annual meeting, second Thursday in March. Albert S. Bigelow, president; W. J. Ladd, secretary and treasurer; preceding officers, J. Henry Brooks, Edw. S. Grew, Norman W. Haire and Edward R. Hall, directors; Wm. E. Parnell, superintendent; Wm. J. Uren, assistant superintendent; A. Lincoln Burgan, mill superintendent; Jas. P. Richards, head mining captain; Hugh James, mining captain Osceola branch; Joseph Biscomb, mining captain North Kearsarge branch.

The following table gives comparative figures for calendar years 1903 and 1904:

	1903.	1904.
Tons rock stamped	924,400	1,095,520
Pounds mineral obtained	21,904,243	27,457,497
Percentage fine copper in mineral.	73.317	74.560
Pounds fine copper per ton of rock.....	17.4	18.7
Cost of fine copper per pound	10.29c	9.96c
Balance of assets	\$131,559.63	\$505,929.40

Mining lands, 2,120 acres, in 4 separate tracts, also an extensive millsite and sundry timber and miscellaneous lands, in Houghton and Keweenaw counties, Michigan.

The mines of the Osceola Consolidated are the Osceola proper, North Kearsarge, South Kearsarge and Tamarack Junior. Mining at the old Osceola was first done in 1873, on the southern extension of the Calumet conglomerate, 6 shallow shafts being sunk thereon, but this bed proving unremunerative, except under a few acres, was abandoned and work begun on the Osceola amygdaloid, lying parallel with and 730' east of the Calumet conglomerate. The Osceola mine proper, area 720 acres, lying next south of the Calumet & Hecla, has 6 shafts on the Osceola bed, which has a strike of approximately N. 39° E., shafts being numbered from north to south. Shafts 1 and 2 are permanently abandoned. No. 3, with 3 compartments and about 3,000' deep, and No. 4, 600' next south, with 3 compartments and about 3,700' deep, are idle, with small likelihood of reopening, as ground is nearly exhausted and the good stopes remaining can be reached from No. 5. No. 5,

1,300' south of No. 3, is 3,900' deep, cut down and retimbered throughout in 1903. No. 6, or Opechee shaft, 1,300' next south, 4,100' deep, shows some excellent stopes, especially in the southern drifts. Shafts 5 and 6 have practically duplicate surface equipments, with Nordberg hoists good for 6,500' depth. About 60% of the production of the old Osceola is secured from No. 6, and 25 power drills are worked in the two shafts. Crosscuts have been sent to the Calumet conglomerate at various depths, without encouragement, and diamond drilling was done in 1904 to locate and test the Kearsarge amygdaloid on the Osceola tract. The mine has a complete power equipment, with shops, mostly of stone, and a large number of dwellings for workmen. Water is pumped from Lake Superior for use of the mine and employees.

The Tamarack Junior, area 120 acres, lying between the Centennial and Calumet & Hecla mines, has 2 vertical shafts on the Calumet conglomerate, No. 2 being 3,360' deep, with 12 levels opened. Mining was stopped in 1902 and exploratory work was suspended Jan. 1, 1904. Apparently the Tamarack Junior is dead for all time to come.

The North Kearsarge, area 1,120 acres, lies north of the Wolverine, with which it has underground connections, and with which land was traded to the extent of $13\frac{1}{2}$ acres, this exchange permitting each mine to square its boundaries with the strike of the lode. Shafts are numbered from south to north. No. 1 shaft, 3,700' deep, has a Nordberg hoist good for 6,500' depth, operating two 6-ton skips in counterbalance. No. 2 shaft, out of commission, is 2,400' deep. No. 3 is 2,600' deep, developing an enormous area of rich ground of exceptionally uniform value, the north drifts being particularly encouraging, while the Ahmeek developments point to rich ground for the North Kearsarge to its northern boundary line. The southern drifts from No. 1 toward the Wolverine also are in excellent ground. There is room at the north for an additional shaft beyond No. 3. The North Kearsarge employs 40 power drills, and old shafts and drifts have been straightened. The Kearsarge amygdaloid ranges 16' to 20' in width in this mine, and, while bunchy, shows some of the best stopes ever opened in the Lake district. At No. 1 shaft there is a stone compressor-house and 30-drill compressor. The office building, combination machine and carpenter shop and warehouse, all of wood, are at this shaft. At No. 3 is located a 45-drill compressor, with two-stage air end and compound steam end, having 22x48" and 42x48" steam cylinders and 40x48" and 36x48" water-jacket air cylinders and vertical intercooler, housed in a 25x55' stone and brick building with steel truss roof.

The South Kearsarge, area 160 acres, lies south of the Wolverine and east of the Centennial. Development was begun September, 1899, and the best stopes are toward the Centennial line, the lode showing about the same width as in the North Kearsarge and Wolverine mines. The South Kearsarge is opened by 2 shafts, ample for all future requirements, these being 1,100' apart. No. 1, the northern shaft, is 1,495' deep and can be sunk about 3,000' before reaching the boundary line. Two skips are operated in coun-

terbalance, and the shafthouse is exceptionally large and well equipped, as it also cares for the rock from No. 2 shaft, with which it is connected by a 1,100' trestle. No. 2 shaft is 1,360' deep and can be sunk to a depth of about 2,800' before reaching the boundary line. The surface equipment of the South Kearsarge is mainly second-hand, but efficient and ample for all present requirements. The mine has air compressors of 55 drills aggregate capacity, and works about 10 drills. New openings in the various branches of the Osceola Consolidated were 26,386' in 1904, and for the past 4 years have been 97,183', the cost of openings being charged direct to operating expenses. There is but little rock selection, only 9% of the rock broken in 1904 having been discarded.

The Osceola has three stamp-mills, on the shore of Torch Lake, adjoining those of the Tamarack. The old wooden mill, built 1886 and now idle, has four heads of an average daily capacity of perhaps 300 tons each. The second mill is 135x215', completed 1899, with three stamps having 20" pistons with 24" stroke, supplied with circular shoes and striking 100 blows per minute at 95 lbs. steam pressure. These heads have stamped above 550 tons each, on test runs. The screens are circular, with $\frac{3}{4}$ " openings, allowing easy discharge of coarse copper. The third mill, completed 1902, stands in line with the other two, and is of steel, 176x213', with 4 Nordberg heads of the 4-valve type, having 20x24" cylinders and circular mortars with $\frac{3}{4}$ " screens and hydraulic separators. About 20% of the copper secured in milling comes from the separators and the mortar discharges. One of the Nordberg heads has been compounded. The compounding of the head, by superimposing the low-pressure cylinder above the high-pressure cylinder, was first suggested by Mr. A. L. Burgan, mill superintendent of the Osceola, and the idea was carried into execution by Mr. B. V. Nordberg. The high-pressure cylinder in this head is double-acting, giving power for both the up and down strokes, while the low-pressure cylinder imparts power on the down-strokes only. On test this head has an average daily capacity of about 740 tons, as compared with an average efficiency of 550 tons from the single-acting heads, an increase of a trifle more than one-third in effective duty, with a saving of about 35% in fuel consumption. Orders have been placed for the compounding of the remaining heads in the new mills.

There are 110 Hodge jigs, with quick eccentric return motion, with 6 round tables and one Wilfey table for each stamp, the latter taking headings from the round tables, also an Allis-Chalmers Chilean mill for regrinding. For reducing oversize material from the mortars of the stamps, crushing rolls with fixed bearings have been introduced, this also being an idea original with Mr. Burgan, and which is working well in practice. In order to care for the greatly increased amount of rock that will be treated by the compounded heads, the mills are to be remodeled, providing an increased capacity of 20% to 25% in the washing department.

The 43x150' steel boiler-house, adjoining the mills and furnishing power for all three, has three 250-h. p. 72" boilers of 150-lb. pressure and nine 84"

250-h. p. boilers of 105-lb. pressure, all of the locomotive firebox type. Coal is brought to a 500-ton bin over a trestle, in railroad cars. An automatic ash-discharge flushes water from a stand-pipe at intervals of 3 minutes. Draft is furnished by a 150' brick-lined self-supporting steel stack. An Allis-Chalmers Corliss engine runs a Morgan-Gardner direct-current 220-volt generator of 100-kw. capacity, operating incandescent and enclosed arc lamps.

The joint pumphouse of the Osceola and Tamarack mines is 35x70', of steel, housing a 40,000,000-gallon triple-expansion Nordberg pump having 22", 40" and 60" cylinders, with three 30" horizontal plungers of 52" stroke and 42" discharge. Water is secured through an 8' tunnel running 1,275' under Torch Lake and drawing water through 3" intake holes, these guarding against clogging by ice. Rock is hauled from mine to mill by the Hancock & Calumet railroad.

Production of 1904, was 20,472,429 lbs. fine copper, and the extraction was 18.7 lbs. fine copper per ton of rock stamped, as compared with 17.4 lbs. in 1903 and 16 lbs. in 1902. Total operating costs in 1904 were \$1.74 per ton of rock stamped, or \$1.86, including construction. Costs were 9 cents per lb. of fine copper, or 9.96c. including construction charges. Only 9% of the rock broken was discarded. Two dividends of one dollar each were paid in 1904, and a \$2 semi-annual dividend, payable in January, was declared December, 1904.

The Osceola Consolidated is a very valuable property, and while its growth has not been so rapid as was hoped for by shareholders, it should be borne in mind that the work performed has been very extensive, and that while the work may not have been done rapidly, it has been done well. The year 1905 should be much the most prosperous in the mine's history.

OSCEOLA GOLD & COPPER MINING CO. **WYOMING.**

Property sold to North American Copper Co.

OSCEOLA JUNIOR MINING CO.

WYOMING.

Office: Rawlins, Wyo. J. M. Rumsey, secretary. Supposed to have lands in vicinity of Rudefeha, Carbon county, Wyoming.

OSCURO COPPER CO.

Office: care of H. A. Rideout, Wollaston, Mass. Organized March, 1903, with capitalization \$250,000. Location of lands, if any, unknown.

OSE MINE.

JAPAN.

Mine office: Ose-mura, Kita-gori, Iyo, Japan. Ore is chalcopryrite, averaging 3% to 4% copper, occurring in lenses, the largest of which is 230' long, 100' wide and 43' deep. Production in 1900 was only 9,426 lbs. of refined copper.

OSHKOSH-WYOMING MINING CO.

WYOMING.

Office: care of H. O. Granberg, secretary, Oshkosh, Wis. Mine office, Dillon, Carbon Co., Wyo. Capitalization \$1,000,000, shares \$1 par. O. A. Koch, president. Lands, 9 claims, north and west of the Pluto, opened by pits and shafts of 10' to 75' depth.

LOS OSOS MINE.**CALIFORNIA.**

Office; care of J. M. Gleaves estate, owner, San Francisco, Cal. Property, at San Luis Obispo, San Luis Obispo county, California, was worked circa 1865. Ore occurs in a porphyritic fissure vein traversing sandstone and shales.

OTAVI MINEN- UND EISENBAHN- GESELLSCHAFT. GERMAN SOUTHWEST AFRICA.

Offices: 14, Behrenstrasse, Berlin, W. Germany. Mine office: Swakopmund, German Southwest Africa. Organized 1900, under laws of Germany, with capitalization 20,000,000 marks, in 20 series of 10,000 shares each, par value 100 marks. A Schoeller, chairman; Dr. P. D. Fisher, vice-chairman; A. Gaedertz, general manager; F. Müller von der Werra and Dr. P. Gloner, assistant general managers; Dr. P. Schwabach, general counsel; Th. Gathmann, mine superintendent; Tob. Toennesen, engineer in charge of railway. Lands, 500 square miles, freehold, including the Otavi and Tsumeb copper mines. Latter has been developed largely and can begin production upon a considerable scale when given rail facilities and a smelter. A railroad line of 570 kilometres is now being built from Alexandre, Portuguese Southwest Africa, to the mines, by the firm of Arthur Köppel, at an approximate price of \$4,500,000. The Otavi is a property of more than ordinary importance, and as it is financed and managed by strong and successful men of affairs, is apt to be heard from as a considerable producer eventually, though several years may be required to complete the railroad and smelting plant and put the mine on a good productive basis, development having been hampered, during 1904, by the rebellion of the Herreros.

OTAVI MINES & RAILWAY CO.

See Otavi Minen- und Eisenbahn- Gesellschaft.

OTTUMWA COPPER CO.**WYOMING.**

Office: Laramie, Wyo. Mine office: Holmes, Albany Co., Wyo. C B Richey, president; W. B. Russey, secretary and treasurer. Lands are the Ottumwa group of claims, about 6 miles southeast of the Rambler mine. Company seems conservatively managed.

OUED-MOUGRAS COPPER & IRON CO., LTD.**ALGERIA.**

Offices: 135, Wellington St., Glasgow, Scotland. Organized Oct 9, 1903, with capitalization £12,500, shares £1 par. J. A French, secretary. Organized to carry on mining in Algeria or elsewhere.

COMPANIA MINERA LAS OURAS.**MEXICO.**

Mine office: Tepezalá, Aguascalientes, Mex. Gabriel Chaves, superintendent. Has copper and silver ores. Uses animal power and employed about 40 men at last accounts.

OURAY CHIEF MINING CO.**COLORADO.**

Office: Youngstown, Ohio. Mine office: Ouray, Ouray Co., Colo. W. D. Euwer, president; John Beil, secretary; David Ward, superintendent. Ores carry gold, silver and copper. Has gasoline power and plans installing a small smelter.

SUCESION RAMON F. OVALLE.**CHILE.**

Mine office: Carrizal Alto, Freirina, Atacama, Chile. Operates the Canto del Agua mine, opened 1870, also the Santa Margarita mine, 700' deep, and about a dozen smaller properties. Annual production is equal to about 1,250,000 lbs. fine copper, shipped as matte.

OVERFLOW MINES. (NO LIABILITY.)**AUSTRALIA.**

Offices: 18, Bridge St., Sydney, N. S. W., Australia. Mine office: Bobadah, N. S. W., Australia. T. H. Palmer, manager. Ores carry gold, silver, lead and copper. Has a Ball mill, 40-ton cyanide plant and 50-ton smelter. Employs about 150 men.

OVERLAND GOLD MINING CO.**OREGON.**

Letter returned unclaimed from former mine office, Cableville, Ore. Ores carry gold, silver, copper, lead and zinc.

OVOCA COPPER SYNDICATE, LTD.**IRELAND.**

Offices: Norfolk House, Laurence Pountney Hill, London, E. C., Eng. Mine office: Ovoca, County Wicklow, Ireland. Registered Nov. 27, 1901, with capitalization £12,000, shares £1 par. St. John Winne, secretary. Property is the old Cronnebane mines, in the Vale of Ovoca, which were making about 1,250,000 lbs. of refined copper annually at the close of the Eighteenth Century. Mines were closed, circa 1875, and are to be reopened on the advice of Mr. Philip Argall. Ore is mainly chalcopryite, associated with quartz gangue, averaging a scant 3% copper, 1.5% zinc, 1.5 oz. silver and 1 dwt. 6 gr. gold per ton. High-grade oxide and carbonate ores were mined out in past operations, but the vein, about 50' in average width, shows immense bodies of low-grade disseminated sulphides. Experiments are being conducted with the Neill leaching process, and a new shaft is being sunk.

JOHN OWEN MINING & MILLING CO.**COLORADO.**

Mine office: Idaho Springs, Clear Creek Co., Colo. Geo. Riley, superintendent. Ores carry gold, silver, lead and copper. Has steam power and employs about 25 men.

OWL HEAD MINING CO.**ARIZONA.**

Office and mine: care of Ferris S. Fitch, Tucson, Pima Co., Ariz. Organized, 1904, to take over sundry claims in the Owl Head Mountains, 32 miles from Tucson, carrying auriferous and argentiferous copper ores. Also owns claims 10 miles west of Tucson.

OWOSSO GOLD & COPPER MINING CO.**WASHINGTON.**

Moribund.

OXFJORDALEN COPPER CO., LTD.**NORWAY.**

Offices: 23, Leadenhall St., London, E. C., Eng. W. A. Stearns, secretary. Organized Oct. 28, 1901, with capitalization £10,000, shares £1 par; debentures, £5,000 authorized, £320 issued, at 5%. Property is 32 claims, at Oxfjordalen, Norway, held on option, upon which some development work has been done 1903-1904.

OXIDE COPPER CO.**ARIZONA.**

Office: 85 Ames Bldg., Boston, Mass. Mine office: Red Rock, Pinal

Co., Ariz. T. K. Plancuel, superintendent. Stock is owned by Arimex Consolidated Copper Co. Lands, are the Copper Prince group, of 30 claims, in the Silver Bell district. Has steam power.

PACIFIC CONSOLIDATED MINING CO.

NEVADA.

Office: 131-32 Broadway, New York. Mine office: Reno, Washoe Co., Nev. Organized under laws of South Dakota, with capitalization \$3,000,000, shares \$1 par, in \$200,000 preferred and \$2,800,000 common stock. Chas. B. Hill, president; Wm. Hazen Peck, secretary; H. T. Cowles, treasurer and general manager; R. W. Parry, superintendent; Dr. Jos. Hyde Pratt, consulting engineer. Lands, 33 claims, also millsite and townsite, in the Pyramid district, developed by shafts and tunnels, with about 6,000' of underground openings. Oxidized zone, extending to depth of 200' to 350', gives good gold and silver values, gold values growing small at the water level, but silver values remaining good in the sulphide zone. Ore is chalcopyrite, associated with iron pyrites, in a silicious gangue. Company has franchise for a standard gauge railroad from mines to a point on the Southern Pacific, 10 miles east of Reno, a distance of 28 miles. Property has been favorably reported upon by Dr. Pratt, who enjoys high standing as a competent and conservative authority.

PACIFIC CONSOLIDATED MINING & SMELTING CO.

UTAH.

Office: care of W. F. Snyder, president, Salt Lake City, Utah. C. O. Ellingwood, secretary and treasurer. Organized October, 1902, with capitalization \$1,500,000, shares \$5 par, to develop the Amy and Baltimore groups of 29 claims, in the Merrimac district of Utah.

PACIFIC COPPER CO.

MICHIGAN.

Office: 199 Washington St., Boston, Mass. A. S. Bigelow, president. Organized August, 1890, under laws of Michigan. Lands, 960 acres, northwest of the Atlantic mine, Houghton county, Michigan, carrying the Atlantic ashbed. Had cash assets of about \$25,000 at last accounts. Idle.

PACIFIC GOLD & COPPER MINING CO.

MEXICO.

Office: 308 East 9th St., Kansas City, Mo. J. J. Myers, president; D. C. Rhodes, secretary. Organized under laws of South Dakota to develop extensive holdings of mineral land in the Taviche district of Oaxaca, Mexico.

PACIFIC MINING & DEVELOPMENT CO.

OREGON.

Lands sold and company dead.

PACIFIC MINING & METALS CO.

ARIZONA.

Office: 213 Kittredge Bldg., Denver, Colo. Mine office: Tucson, Pima Co., Ariz. John Russell, president; F. A. Hunt, secretary; John D. Coplen, treasurer and general manager. Organized January 7, 1903, under laws of Arizona, with capitalization \$10,000,000, shares \$1 par. Lands, 30 claims, in two groups, with miscellaneous holdings giving a total area of 760 acres. The north group is on Pinto Creek, 20 miles west of Globe, Gila county, and the south group in the Cañada del Oro district of Pinal county, former group showing country rocks of schists and porphyry, and south group showing granite-porphyry country rock. South group is said to average 5% copper from carbonate, oxide and sulphide ores. The north group has 3,309' of

underground openings, and the south group 550', claimed by company to show 2,000,000 tons of ore. The Globe property is regarded as one of considerable promise.

PACIFIC SMELTING CO., LTD.

CHILE.

Offices: 32, Great George St., Westminster, London, S. W., Eng. Works office: Taltal, Atacama, Chile. Registered July 29, 1902, to take over the property of the Smelting Corporation, Ltd., with capitalization £100,000, shares £1 par; issued, £25,107. Debentures, £40,000 authorized, £3,000 issued, at 5%. A. Radcliffe, general manager, J. H. Melrose, secretary.

PACIFIC STEEL CO.

BRITISH COLUMBIA.

A company by this name was said to own the Sechart copper claims near Alberni, Vancouver Island, B. C., but letter addressed to that point was returned unclaimed.

PACIFIC COAST COPPER CO.

ALASKA.

Reorganized as Pacific Coast Mining, Milling & Developing Co.

PACIFIC COAST MINING, MILLING & DEVELOPING CO.

ALASKA.

A reorganization of the Pacific Coast Copper Co. Has a lease of promising copper claims on Prince of Wales Island, Alaska, but suffers from financial debility.

PACIFIC COAST ORE SAMPLING WORKS.

CALIFORNIA.

Office and works: Oakland, Alameda Co., Cal. J. Bruce Gibson, general manager. Has a 250-ton plant, equipped with electric power.

PACIFIC COAST SMELTING & REFINING WORKS.

CALIFORNIA.

Office and works: Bay Point, Contra Costa Co., Cal. Was built by the Copper King, Ltd., of unfortunate memory. Plant includes a 100-ton furnace, with steam and electric power.

PAGOEAT COPPER CO.

CELEBES.

Is developing sundry copper claims in the Pagoeat district, in the northern part of the island of Celebes, Dutch East Indies. Company is composed of men connected with a prominent steamship line of Amsterdam, Holland. Lands show numerous veins ranging 4' to 5' in width, carrying carbonate ores, chalcocite and chalcopyrite, in quartz gangue, of average assay tenor of about 10% copper, with small gold and silver values. Management is composed of excellent people, who lack mining experience.

PAHAQUARRY COPPER MINING CO.

NEW JERSEY.

Is operating extensively near Dimmick's Ferry on the Delaware river, in Pahaquarry Township, Warren Co., N. J. Was erecting a 200-ton concentrator at close of 1904.

PALACE GOLD & COPPER CO.

ARIZONA.

Office: 1104 D. S. Morgan Bldg., Buffalo, N. Y. Mine office: Wickenburg, Maricopa Co., Ariz. Employs about 25 men. Organized Nov 10, 1902, under laws of Arizona, with capitalization \$3,000,000, shares \$1 par. Geo. A. Sanborn, president; C. M. Clark, vice-president and general manager; M. W. Fuller, secretary; Dr. C. H. W. Auel, treasurer; D. Ainsworth, engineer. Lands, 23 claims, in three groups. The Union mine, apparently one claim only, in the Winifred district, has a 400' main shaft, with about 2,200' of

underground openings, said to show good values in gold, silver and copper. The Ainsworth group, 8 miles southeast of Wickenburg, has 4 prospect shafts, deepest 40'. The third group known as the Tip Top, is in the Bradshaw Mountains.

This company numbers among its directors some men of very high business standing, but the methods of promotion followed in placing the stock are self-condemnatory, and would damn any set of directors, no matter whom they might be. It is charitable to infer that these men, who lack experience in mining, know no better. Stock, all common, is sold at three prices, viz., 25 cents, 50 cents, and one dollar per share. The man who buys for 25 cents gets just shares, the man who buys for 50 cents gets a partial guarantee, and the man who buys for a dollar gets a guarantee of $3\frac{1}{2}\%$ annually for 20 years, which is 70 cents on the dollar, leaving him out the use of 75 cents for an average term of ten years, and paying 5 cents per share more than his neighbor at the outset.

Any guaranteed mining stock is a delusion and a snare. There always is and always must be a "nigger in the fence" somewhere. If the directors of the Palace, some of whom are men of high standing in business circles, wish to clear their skirts, let them drop this rotten farce of "guaranteed" stock, sell shares like other companies long of hope and short of cash, and spend the proceeds in honest mining efforts.

PALM DEVELOPMENT CO.

CALIFORNIA

Office: care of E. M. Ross, Los Angeles, Cal. Lands are 23 miles north-east of Acton, Los Angeles county, California, showing auriferous and argenteriferous malachite, occurring as replacements in a porphyritic dike averaging 180' wide and traceable $1\frac{1}{2}$ miles. Has three shafts, deepest 125'. Had a leaching plant, but water supply gave out. Idle.

PAN AMERICAN EXPLORATION CO.

MEXICO.

Office: 711 Missouri Trust Bldg., St. Louis, Mo. Mine office: Manzanillo, Jalisco, Mex. Organized March 8, 1901, under laws of Missouri, with capitalization \$1,000,000, shares \$10 par; issued, \$725,000. A. K. Vickers, president; Kent E. Keller, secretary; Schuyler S. Gates, general manager. Lands, 159 pertenencias, including the Cacoma mines and smelter, closed down by reason of poor management. Ores carry gold, silver and copper. Has a 200' shaft and 850' tunnel, with water power. Also owns the Camotlán mine, 10 hours ride by horseback from Manzanillo. Property is regarded as valuable, but only a small portion of the funds raised have been expended on actual development.

PAN AMERICAN MINES CO.

MEXICO.

Letter returned unclaimed from former office, Colorado Springs, Colo. Mine office: Etzatlán, Jalisco, Mex. James M. Parker, superintendent. Was developing the Santa Laura mine, carrying copper, gold and silver, with a force of about 20 men, at last accounts.

PAN-AMERICAN MINING & SMELTING CO.

ARIZONA & MEXICO.

Office 905-11 Broadway, New York. Mine offices: Prescott, Yavapai Co., Ariz., and Maguarichic, Chihuahua, Mex. Organized under laws of

Arizona, with capitalization \$15,000,000, shares \$5 par, in \$3,000,000 of 7% preferred and \$12,000,000 of common stock. A. Howard Skinner, president; Harry F. Lindsley, secretary and treasurer; Bowling Green Trust Co., registrar. The Arizona lands, known as the Ambidexter and Barranca del Cobre, were inherited from the Lone Pine Mining Co., alias the Arizona, Eastern & Montana company, promoted by the notorious Dr. R. C. Flower, and the notorious L. E. Pike, Flower being a fugitive from justice, while Pike is still plying his trade and selling swindling mining shares to fools. The Mexican property includes the Recompensia group, at Maguarichic; the Hernandez group, at Minaca, Chihuahua; and La Liga and Santa Camilla mines, at Concepcion, Chihuahua. Company has also some sort of claim to the Quebradillas mine, in the Parral district, price of which was stated to be \$700,000 gold, but it is said that company merely holds this property on an option. The Quebradillas was secured for the company by Grant G. Gillett, the cattle plunger, who 'lit out' of Kansas City between two suns, and who is a worthy associate of Flower and Pike—arcades ambo—verbum sap.

PANTEIDAL COPPER CO., LTD.

WALES.

Offices: 20-21, Lawrence Lane, London, E. C., Eng. G. Thompson, secretary. Capitalization, £25,000. Has mining rights over two farms in Merionethshire, Wales. Apparently moribund.

PANUCO COPPER CO., LTD.**MEXICO.**

Mine office: Panuco, Monclova, Coahuila, Mex. Chas. May, manager. Has extensive mines at Panuco and Romero Rubio, State of Coahuila. The Panuco mines are largely opened and well equipped, having steam power and a small smelter. Company was organized in 1898, and has seen much trouble, owing to rascalities of sundry insiders, and corporation is to be wound up. Production in 1902 was 665 tons refined copper. Property said to have been examined, 1904, by Guggenheim Exploration Co., with a view to purchase.

PANULCILLO COPPER CO.**CHILE.**

Succeeded by Central Chile Copper Co., Ltd.

PAPAGO MINING CO.**ARIZONA.**

Letter returned unclaimed from former office, Aztec, Yuma Co., Ariz.

PAPOVSKI MINE.**SIBERIA.**

Office and mine: Semipalatinsk, Siberia. Owned and operated by Papov's Successors. Production in 1899 was 129,497 lbs. fine copper.

PAR VALUE CONSOLIDATED GOLD & COPPER CO.**COLORADO & UTAH.**

Offices: 514 Fitzsimmons Bldg., Pittsburg, Pa. Mine office: Turret, Chaffee Co., Colo. Employs 20 men. Organized 1900, under laws of Arizona, with capitalization \$2,500,000, shares \$1 par. Joseph H. Reall, president; Campbell Jobes, vice-president; D. R. Anderson, treasurer; Jas. H. Jordan, secretary; R. F. Stratton, general manager; Floyd O. Withrow, superintendent. Lands, 23 claims, area 230 acres, also 60 acres miscellaneous lands, in the Turret and Badger districts, showing 4 fissure veins, averaging 3' width and carrying oxide and sulphide ores, estimated to average 5% copper,

3 oz. silver and \$10 to \$15 gold per ton, opened by shafts of 200' and 400', with about 3,000' of underground openings, estimated to expose about 5,000 tons of ore. Has steam power.

PARADOX COPPER-GOLD MINING CO.

COLORADO.

Absorbed, 1903, by San Juan Smelting & Refining Co.

PARAMATTA COPPER MINES, LTD.

AUSTRALIA.

Offices: 22, Chancery Lane, London, E. C., Eng. Mine offices: Wallaroo, Daly county, and North Yelta, Daly county, South Australia. Organized May 18, 1899, with capitalization £200,000, shares £1 par; issued, £198,500. Debentures, £20,000 authorized, £6,240 issued, at 5%. Lands, 1,340 acres, held on 99-year lease at annual rental of \$1 per acre, plus 2½% net profits. Property includes the Paramatta, Yelta, Wheal Hughes and Wheal James mines. The Paramatta, adjoining the Wallaroo mines of the Wallaroo & Moonta, is an old and important producer, reopened, 1900, by present owners. Deepest shaft is 500', bottomed in a vein ranging up to 8' width, with richest portions carrying up to 25% copper, and having about 50,000 tons of ore reserves. The Paramatta has been given a modern hoisting and dressing plant, concentrator being of 200 tons daily capacity, and smelter of same size. The Yelta mine, taken over, 1903, from the New Yelta Copper Mining & Smelting Co., Ltd., is being reopened on a fair scale and equipped with modern machinery. Production, 1903, was 20,646 long tons of ore, yielding a profit of £8,965. Company paid a dividend of 25% in 1903, and a 2% dividend in 1904.

PARINGA COPPER MINES, LTD.

AUSTRALIA.

Letter returned unclaimed from former office, 34, St. Mary Axe, London. Mine office: Callington, Adelaide, South Australia. W. Davis, mine manager. Capitalization £200,000. Lands, 172 acres, 36 miles from Adelaide.

PARK GOLD & COPPER MINING CO.

IDAHO.

Mine office: Mullan, Shoshone Co., Idaho. Has a 1,000' tunnel, opening a 20' vein claimed to assay 8% to 30% copper.

PARK CITY MAJESTIC MINING CO.

UTAH.

Letter returned unclaimed from former office and mine, Park City, Summit Co., Utah. Lands, 12 claims, opened by a 200' tunnel showing 3 parallel veins 8' to 20' wide with 4 pay-streaks, largest 9", carrying auriferous copper carbonates and galena, said to give assays of 13% copper, 30 oz. silver and \$18 gold per ton.

COMPAÑIA EXPLOTADORA DE PARRAL.

MEXICO.

Mine office: San Bartolo, Durango, Mex. Operates El Lentisco mine, producing gold and copper, and employed about 40 men at last accounts.

PARROT SILVER & COPPER CO.

MONTANA.

Office: Washington & Church Sts., Boston, Mass. Mine office: Butte, Silver Bow Co, Mont. Employs about 400 men. Chas. H. Dickey, president; Chas. D. Burrage, secretary; John D. Ryan, managing director; Harry A. Galway, superintendent. Organized 1880, under laws of Montana, with capitalization \$2,300,000, shares \$10 par; issued, \$2,298,500. Paid quarterly dividends of 50 cents per share on Sept. 12 and Dec. 12, 1904.

last preceding dividend having been 50 cents, in January, 1902. Held an "annual" meeting June, 1904, this being first for 4 years, owing to injunctions from courts restraining meetings. Is controlled, through stock ownership, by the Amalgamated Copper Co., and like all other Amalgamated sub-companies, is engaged in exceedingly involved, costly and apparently interminable litigation, with the Heinze interests, over ownership of ore bodies.

The following table gives a summary of operations and results for the fiscal years ending June 30:

	1903.	1904.
Tons of ore extracted	253,284	165,408
Total cost of mining	\$710,831	\$466,375
Total cost of transportation	45,591	29,773
Total cost of reduction.....	692,266	.....
Paid for labor	771,701	676,629
Paid for machinery and supplies	631,396	330,260
Marketing, refining and seaboard expenses	220,814	29,773
Gross proceeds	2,255,869	1,270,627
Total expenditures.....	1,669,503	1,036,663
Net proceeds	586,366	233,964

Lands, 19 claims, mainly fractional, area circa 25 acres, well located in the central portion of the Butte district, the Parrot, opened 1884, being one of the pioneer mines of the camp. A barren zone occurs at a depth of about 1,000', but good ore bodies are found below. The ore averages about 3% copper and carries fair silver and gold values. Properties operated are the Parrot, Bellona, Little Minah and Original No. 6 mines. The Little Minah has a 1,000' two-compartment shaft and is connected underground with the Nipper. The main shaft of the Parrot, about 1,700' deep, has three compartments to the 4th level and 4 compartments below, being connected underground with the Colusa-Parrot, Never Sweat, Nipper and Original mines. This shaft was retimbered in 1904, and has a steel gallows-frame, 112' high and weighing 125 tons, with a maximum load capacity of 50 tons. The Parrot shaft has a 2,500-h. p. hoist, with 28x96" cylinders, capable of raising 10-ton loads from a depth of 3,000', hoisting two double-deck cages with 10-ton skips swung under, using a flat steel rope $\frac{5}{8}$ " thick and 8" wide. Machinery plant includes an 80-drill Ingersoll-Sergeant air compressor and a 22-drill Rand compressor. Mine buildings are mainly of steel, stone and brick, these including a new engine-house, boiler-house, compressor-house and various shops. The mine has an antiquated smelter, idle since 1900, ores being reduced at the Washoe plant of the Anaconda. Company also owns copper refining works at Bridgeport, Conn., these also being antiquated and idle.

Ores are running lower in grade than formerly, like all other Butte mines, and now average about 4% copper, with fair gold and silver values. Production was about 12,500,000 lbs. fine copper for 1904.

PARRY SOUND COPPER MINING CO., LTD.

ONTARIO.

Office: 604 Germania Life Insurance Bldg., St. Paul, Minn. Mine

office: Parry Sound, Ont. Robert Forbes, agent. Lands, about 14,000 acres, including the McGown and Wilcox mines, on the eastern shore of Georgian Bay. Ores are auriferous, chalcopyrite and bornite. Has a 10-stamp mill.

GEWERKSCHAFT PASCHA.

GERMANY.

Office: Düsseldorf, Rheinprovinz, Germany. Paul Müller, president. Has ores of iron, copper, zinc and lead, employing about 25 men.

PASS CITY COPPER CO.

MEXICO.

Office: care of H. E. Runkle, El Paso, Texas. Property is sundry claims in the Sierra de Las Arradas, district of Bravos, Chihuahua, Mexico, developed by 2 shafts, a tunnel and an open cut, with a total of about 350' of openings, showing stringers of oxide and carbonate copper ores in limestone.

PATHFINDER CONSOLIDATED MINES, LTD. **BRITISH COLUMBIA.**

Mine office: Grand Forks, B. C. John Rogers, superintendent. Ores carry gold, silver and copper. Has steam power.

PAUDORNE COPPER MINING CO.

VIRGINIA.

Company refused to accept a letter addressed to Houston, Virginia. Organized December, 1902, under laws of South Dakota, to do a general mining business in Virginia.

PAVO RICO MINING CO.

MEXICO.

Controlled by Atlas Exploration & Mining Co.

PAYMASTER COPPER MINING CO.

WYOMING.

Letter returned unclaimed from former mine office, Encampment, Carbon Co., Wyo.

PAYMASTER MINE.

UTAH.

Mine office: St. George, Washington Co., Utah.

PEACH BOTTOM COPPER CO.

NORTH CAROLINA.

Letter returned unclaimed from Elk Creek, Ashe Co., N. C.

PEACOCK COPPER CO.

CALIFORNIA.

Office: 114 Liberty St., New York. Mining office: Bagdad, San Bernardino Co., Cal. Robert Dixon, president; C. B. F. Palmer, secretary; Newton Evans, general manager; C. F. Schrader, superintendent. Organized under laws of West Virginia, with capitalization \$1,500,000, shares \$5 par. Lands, 200 acres, are in the Lavie district, showing sundry copper ores, mainly chalcopyrite of concentrating grade, occurring in old lava flows, assaying 8% to 10% copper, 8 oz. silver and \$2 to \$5 gold per ton. Has steam power, with 50-ton concentrator 8 miles from the mine. Ore body said to have proven merely a pocket, which has petered out.

PEAK COPPER CO.

MICHIGAN.

Former secretary of company claims corporation never was organized.

PEAK MINE.

AUSTRALIA.

An idle property at Peak Downs, Clermont, Central Queensland, Australia, from which very rich ore was obtained at the opening of the mine. Property paid £278,250 profits to shareholders, after trucking ore about 300 miles. An attempt to reopen the mine, circa 1898, was frustrated by a decline in copper and the death of the manager. Property is freehold

and exempt from labor conditions. Mr. W. Lees, of Brisbane, states that a considerable tonnage of ore is in sight, and that the property is worthy of investigation.

PEARL COPPER MINING CO.**COLORADO.**

Letters returned unclaimed from former mine office, Pearl, Larimer Co., Colo.

PEARL COPPER MINING & SMELTING CO.**COLORADO.**

Mine office: Pearl, Larimer Co., Colo. W. L. Culbertson, president; P. B. Coolidge, manager; R. E. Coburn, secretary; T. J. Riley, superintendent. Lands, include the Copper King and Swede groups, opened by a 400' shaft showing considerable ore of excellent average grade, values being in copper, gold and silver. Has steam power.

PEARL AND LILLIE MINE.**COLORADO.**

Mine office: Newett, Chaffee Co., Colo. F. H. Denman, superintendent.

PEARL SMELTING CO.**COLORADO.**

Controlled by National Mining & Milling Co.

PECOS COPPER CO.**NEW MEXICO.**

Office: 361 The Arcade, Cleveland, Ohio. Mine office: Pecos, Chaves Co., N. M. Alfred H. Cowles, president; O. W. Alexander, superintendent. Is sinking a shaft and employs 15 to 20 men. Plans installing a concentrator and small smelter.

PEERLESS MINING & MILLING CO.**COLORADO.**

Office and mine: Salida, Chaffee Co., Colo. Lands, 6 claims, on Cyclone Mountain, 16 miles west of Salida, opened by an 800' crosscut tunnel, showing ores carrying values in lead, copper, gold and silver, lead predominating.

PEHOVAZ HERMANOS y CA.**PERU.**

Mine office: Uliachin, Cerro de Pasco, Peru. Firm operates a mine that is a small producer of silver and copper.

PELLON COPPER KING MINES.**ARIZONA.**

Lands, sundry claims in vicinity of Tucson, Pima county, Arizona.

PENA COPPER MINES, LTD.**SPAIN.**

Offices: Suffolk House, 3, Laurence Pountney Hill, Cannon St., London, E. C., Eng. Mine office: Nerva, Huelva, Spain. Registered September, 1900, with capitalization £450,000, shares £1 par; issued, £400,000. Debentures, £200,000 authorized, £193,800 issued, at 5%. Carl Heinrich Von Siemens, chairman; Nicol Brown, deputy-chairman; T. Stevenson Dick, secretary; T. D. Lawther, mine manager. Lands, 183 hectareas, 2 miles northeast of the Rio Tinto, being the Peña del Hierro group of 17 old mines, taken over from the Sociedad Peninsular de Brussels.

Extraction is mainly from open pits, and large quantities of overburden are removed, the quantity of earth and rock stripped in 1903 having been 177,295 cubic metres. Ores are divided into cupreous pyrites, iron pyrites and washed sulphur ore, latter being ores previously leached for copper and sold later for sulphur contents. The mining plant is modern and complete, including hoists, crushing plant, shops and dwellings. The leaching plant has settling tanks, boilers, pumps, etc. A 2½ mile private railway

line connects the mines and works with the nearest railway, the private line having a locomotive and 14 cars. The cupriferous iron pyrites of the Sierra Morena lend themselves with special aptitude to copper extraction by a combination of natural weathering and artificial leaching, and this process, in use by the Peña, gives cheap costs, but entails long waits and tremendous investments before profits are returned. An average of 8 to 10 years is required to extract all copper values, and this means that the operators must put more in than is taken out, for this length of time. For 1902 the actual production of refined copper was only 624 long tons, although the ores placed in process of extraction are estimated to have carried 2,700 long tons. Eventually this discrepancy will be overcome, and the profits will be correspondingly great. Despite the necessity of burying immense sums, in tereros, the company "turned the corner" in 1903, netting a profit of £21,559 17s. 8d. in that year, and paying therefrom a dividend of 2.5%. For 1904 production was 982 long tons of copper, and the year was ended with upwards of 500,000 tons of ore on the teleros and tereros. The property is ore of great value, and has a most excellent management.

SOCIEDAD ANONIMA MINERA DE PEÑAFLO.

SPAIN.

Office: Bilbao, Vizcaya, Spain. Mine office: Peñaflo, Sevilla, Spain. Organized Jan. 1, 1901, under laws of Spain, with capitalization 4,500,000 pesetas. Don Luis de Salazar, president; Don P. Alzaga, manager; Don Angel Izarde y Alzate, superintendent. Property includes the Concepcion, Descuido and Segunda Preciosa mines, which have been unwatered by an electric pumping plant, and are being prepared for production upon a considerable scale.

PEND D'OREILLE GOLD & COPPER MINING CO.

WASHINGTON.

Mine office: Davenport, Lincoln Co., Wash. J. B. Tuttle, superintendent.

SOCIEDAD PENINSULAR DE BRUSSELS.

SPAIN.

Wound up, and mines sold to Peña Copper Mines, Ltd.

PENINSULAR MINING & SMELTING CO.

MEXICO.

Office: 301 Bradbury Bldg., Los Angeles, Cal. Mine office: San Quintin, Baja California, Mex. Employs about 100 men. Organized 1902, under laws of Arizona, with capitalization \$5,000,000, shares \$1 par. Maj. Geo. H. Sisson, president; B. W. Washington, secretary; Colin Timmons, general manager; C. R. Dagget, mine superintendent. Lands, 48 groups of claims, lying circa 200 miles south of San Diego, California, northwest of the Boleo, on the opposite or west coast of Lower California. The various claims are 4 to 15 miles from tidewater, with roads to the land-locked harbor of San Quintin, one of the best havens between San Diego and Acapulco. In addition to mining lands the company has a 50-acre millsite and 6,000 lots in the town of San Quintin.

The various groups of claims show a considerable variety of ores, and 6 groups have mines more or less developed. Principal operations are at the Julio Caesar and Santa Maria, the latter said to have a 20' vein opened by a 100' shaft, with a second vein, the Alexandria, ranging 6' to 12' in width.

Sundry fissure and contact veins, of 6' to 40' width, with gossan cappings, on the company's various properties, are claimed to be developed sufficiently to show upwards of 250,000 tons of ore averaging 10% copper, 15 oz. to 60 oz. silver and \$8 gold per ton, which in all likelihood is an overestimate. The ores seem to be of sufficient variety to afford a free-smelting mixture.

The company claimed, in 1903, to have a 150-ton furnace building in Los Angeles, for a proposed smelter, and the company figured that ore could be trammed to the coast and lightered to the smelter at a cost of not exceeding \$2 per ton. Other estimates of costs are \$1 per ton for mining and \$2 per ton for smelting, total \$5, which figure must be considered dangerously low. The Peninsular railway has a station at the smelter site. The company also plans erecting and operating coke ovens, estimating that coke can be produced at a cost of \$6 per ton. The somewhat ambitious plans of the company also include the maintenance of a steam barge line, waterworks, telegraph and telephone systems, electric lights and a general store. No trace of the new 150-ton smelter has been secured for this edition of the Copper Handbook, and the company is regarded as unduly optimistic in its promises.

PENN MINE.**MICHIGAN.**

Office: care of J. H. Rice, Houghton, Mich. Lands, 1,440 acres, in Ontonagon county, Michigan. Fully described in Vol. II.

PENN MINING CO.**CALIFORNIA.**

Mine office: Campo Seco, Calaveras Co., Cal. Albert C. Harmon, manager. Operates the old Campo Seco, Hecla and Satellite mines, which were considerable producers, circa 1860-1870. Ores are slightly argentiferous and auriferous chalcopryite, associated with sphalerite and iron pyrites, with gangue ranging from talcose schist through clay to quartz. Has 5 tunnels and 2 shafts, deepest being a new shaft of 500', cutting a 30' ore body at a depth of 400', on which drifts have been carried 200'. Has steam and gasoline power and reverberating furnaces of 50 tons and 75 tons. Matte is brought up to 60% in tenor, in three heats. Cement copper also is produced by leaching old waste-burrows.

WILLIAM PENN MINING CO.**WYOMING.**

Office: Lewisburg, Pa. Mine office: Encampment, Carbon Co., Wyo. J. E. Hedding, president; J. W. Van Valzale, secretary and treasurer; S. E. Phelps, manager. Organized, 1903, under laws of Wyoming, with capitalization \$1,000,000, shares \$1 par; \$350,000 unissued. Lands, 3 claims, area 60 acres, in the Upper Platte district, showing a 4' vein carrying carbonate ores and chalcopryite, opened by a 75' shaft.

PENN-WYOMING COPPER CO.**WYOMING.**

Office: Seventeenth & Blake Sts., Denver, Colo. Mine office: Rudefeha, Carbon Co., Wyo. Works office: Encampment, Carbon Co., Wyo. Employs 300 men. Organized Sept. 13, 1904, under laws of Wyoming, with capitalization \$10,000,000, shares \$1 par, as successor of the North American Copper Co., organized 1902, under laws of New Jersey, with capitalization \$20,000,000, shares \$100 par. Controls, through ownership of stock, the Encampment Smelting Co., Encampment Tramway Co., Ferris-Haggarty Copper Mining

Co., Emerson Electric Light Co., Encampment Pipeline Ditch Co., Encampment Land & Town Lot Co., North American Mercantile Co. and Carbondale Coal Co. E. M. Cobb, president; C. P. Collins, first vice-president; E. K. Hum, second vice-president and general manager; John J. Carter, secretary and treasurer; preceding officers, Joseph Seep, J. R. Leonard, Frederick Davidson, F. B. Draper and W. L. Bell, directors; S. S. Raymond, general superintendent; W. A. Connelly, mine superintendent.

Lands, 5 claims, area 103 acres, patented, including the Ferris-Haggarty and Osceola mines, also 24-acre millsite and 207 town lots, in the Bridger district. The Ferris-Haggarty mine shows an outcrop of decomposed, spongy limonite, with carbonate copper stains, underneath which is a fissured zone of about 20' average width, having a micaceous schist hanging-wall and slightly stratified quartzite footwall, with a strike of northwest and southeast and dip of 50° to the southwest, with diorite dikes on either side of the wall rocks. At a depth of about 40' the ore is a solid bornite, carrying 30% to 45% copper, and \$2 to \$9 gold per ton. This rich zone practically has been worked out, the bornite being replaced by disseminated chalcopyrite in the lower levels, said by company to average 10% copper, 1.75 oz. silver and \$6 gold per ton. Actual values probably will be found to run about 7% copper, with perhaps \$2 to \$3 gold per ton. Mine is opened by a 600' shaft and 1,400' tunnel, these connecting and permitting economical ore extraction through the latter by compressed air locomotives. Mine is estimated by company to have 150,000 tons of ore blocked out for stoping.

The power plant of the mine is located at the mouth of the tunnel, including 240-h. p. from steam engines, 4 hoists, a 25-drill air-compressor, and a 3-stage Norwalk compressor furnishing air at 1,200 lbs. pressure to a 5x8" Porter locomotive, used for underground traction. The mine uses 24 power drills. Buildings include a 30x40' wooden machine shop, 20x40' wooden carpenter shop, 25x32 wooden smithy, office, warehouse, bunkhouse, eating-house and 14 dwellings.

The smelter, at Encampment, is 16 miles from the mine, and connected therewith by a Leschen aerial tramway, which is the longest installation of the sort ever made. The tram is built in 4 sections of 4 miles each, and is operated by steam power, generated at 3 stations, 4 miles apart, each station having storage bins. The length of cables is 293,275'; weight of cables, 439,669 lbs.; number of tension stations, 16, four being double; greatest elevation above sea level is 10,690', on Bridger Peak; highest tower, 69'; number of towers, 170; highest span, 250' above ground at Heaning's Gulch; longest span, 2,200' across Cow Creek canyon; general rise, 900'; number of buckets, 840, capacity 700 lbs. each; speed 4 miles per hour; maximum daily capacity, 984 tons. Plant has automatic filling and discharging devices and was built so that its capacity can be doubled whenever desired. The concentrator, undergoing remodeling at the close of 1904, is 250x350', of wood, equipped with two 10x20" Blake crushers, 2 Bradley centrifugal crushers, 4 trains of rolls, 1 Hancock jig, 28 Wilfley tables, 12 vanners and 6 slime tables. There also is a complete sampling mill. The concentrator

puts about 3 tons into 1, delivering concentrates of 25% average copper tenor to the smelter.

The smelter, of 500 tons daily capacity, on the west branch of the Grand Encampment river, has a 100-ton Davies calcining furnace, 40-ton straight-line mechanical roaster and water-jacket furnaces of 200 and 300 tons capacity, with 3 converter stands, operated electrically, using 6 shells of the Copper Queen type, a 20-ton electric crane, briquetting plant for fines and flue-dust, and a 7' silica mill, the linings, which require replacing after every second charge, being made of mixtures of quartz and clay. Blowers for blast and the air-compressor for converters are driven by water power, with electric power for cranes, slag-line and other uses. Product is a 99.3% blister copper. A 23' dam on the South Fork of the Grand Encampment river, 4 miles from the smelter, gives water through a 48" wooden pipe-line, developing 750 h. p. and driving 5 wheels, two being direct-connected by shafting and rope-drive with the concentrating machinery, the other three being used to generate electricity.

Fuel used for power purposes is wood, costing \$3.50 per cord. The company has mines of lignite at Carbondale, 12 miles from Encampment, on the line of its aerial tram. Smelter fuel is coke, costing \$12 per ton. Mine is 45 miles from nearest railway, which is a very serious drawback, and the property, while it may prove its worth, cannot become permanently successful until given railway connections. Average costs are \$2.50 per ton for mining, 80 cents for concentrating and \$7.50 for smelting, giving an average estimated cost of 7 cents per pound for refined copper. Production is given by company at 686,000 lbs. for 1902, 4,200,000 lbs. for 1903 and 10,000,000 lbs. for 1904, but in all likelihood this is a clerical error, the ten million pounds being meant for an estimate of 1905 production, and the 4,200,000 lbs. being the actual 1904 output in round figures.

The Penn-Wyoming has the elements of a large and profitable mine, but it must have rail connections to become a permanent success. In the Twentieth Century the help of the iron horse is required in the making of any great copper mine.

PENNSYLVANIA CENTRAL GOLD MINING CO.

COLORADO.

Mine office: Russel Gulch, Gilpin Co., Colo. J. J. Riley, superintendent. Property is the Delaware Chief mine, carrying ores of gold, silver and copper. Has steam power and employs about 15 men.

PENNSYLVANIA COPPER CO.

NEW MEXICO.

Office: Lyndhurst Blk., Shamokin, Pa. Mine office: San Pedro, Santa Fé Co., N. M. Thos. A. Lister, Albuquerque, N. M., president and general manager; M. F. Nagle, secretary and treasurer; Chas. W. Myers, superintendent. Lands, 9 claims, area 180 acres, in Bernalillo county, New Mexico. Has 8 fissure veins, of which one is developed by a 230' shaft, ore from which has given smelter returns of 21% copper and 13 oz. silver per ton.

PENNSYLVANIA COPPER MINING CO.

PENNSYLVANIA.

Office: 1221 Arch St., Philadelphia, Pa. Mine office: Pottstown, Montgomery Co., Pa. Organized December, 1902, under laws of Delaware,

with capitalization \$200,000, shares \$1 par. Franklin D. Hoffman, president; Edwin J. Quigley, vice-president; Paul Morris, secretary and treasurer. Lands, 176 acres, 2 miles from Pottstown, slightly developed by a shallow shaft, with a few short drifts, showing ores assaying 5% to 10% copper. Installed a 50-ton water-jacket blast furnace in 1904.

PENNSYLVANIA MINE.**WASHINGTON.**

Letter returned unclaimed from Egypt, Lincoln Co., Wash.

PENNSYLVANIA MINING CO.**NEW MEXICO.**

Office: Franklin, Pa. Mine office: Los Cerillos, Santa Fé Co., N. M. Wm. A. Brown, superintendent. Ores carry gold, silver, copper and lead. Has gasoline power and employed 10 to 12 men at last accounts.

SOCIEDAD ANONIMA MINAS DE PEÑUELAS.**SPAIN.**

Office and mine: Alosno, Huelva, Spain. Don José Maria de Soto, president; Don Antonio Abad Sánchez, treasurer; Don Antonio Repiso Arribas, secretary. Lands, 130 hectareas, carrying cupriferous iron pyrites.

PERCIVAL MINE.**WISCONSIN.**

A prospect, slightly developed, 1898-1899, in Chippewa county, Wisconsin.

PERCY-CHESTER CONSOLIDATED MINING CO.**COLORADO.**

Office: Council Bluffs, Iowa. Mine office: Red Cliff, Eagle Co., Colo. F. M. Donald, lessee; B. A. Hart, superintendent. Ores carry gold, silver and copper. Has steam power.

CRESCENCIO PEREZ.**MEXICO.**

Office and mine: Mineral de Asientos, Aguascalientes, Mexico.

FRANCISCO DE P. PEREZ.**CHILE.**

Operates the Central mine, opened 1880, in the department of Santiago, Chile. Has a matting furnace and produces the equivalent of 500,000 to 600,000 lbs. refined copper yearly.

PERKIOMEN LEAD & COPPER MINES.**PENNSYLVANIA.**

At Shannonville, Montgomery Co., Pa. Once extensively worked, and produced a large variety of copper and lead ores. Idle for some years.

PERSON CONSOLIDATED COPPER &**NORTH CAROLINA.****GOLD MINES CO.**

Mine office: Virgilina, Halifax Co., Va. Property is 1,372 acres in several neighboring tracts, including the Durgy mine, located in Person county, North Carolina. Organized under laws of New York, with capitalization \$1,000,000, shares \$10 par. E. D. Beecher, president and general manager. Main shaft, 330'. Vein averages 4' width, carrying ores ranging from 4% to 20% in copper tenor. Has good steam power equipment and 50-ton concentrator, shipping concentrates averaging 45% copper and 20 oz. silver per ton, with small gold values. Also sends a limited amount of high-grade ore, averaging 30% copper and 10 oz. silver per ton, direct to smelter.

PERUVIAN COPPER MINING & SMELTING**ARGENTINA.****CORPORATION.**

Formed to acquire properties of Carranza-Lafone Copper Mining & Smelting Corporation, Ltd., but fell through.

DR. CARL PETERS ESTATES & EXPLORATION CO., LTD. RHODESIA.

Name changed, October, 1903, to South-East Africa, Ltd.

PETOSKEY MINING CO.**ARIZONA.**

Letter returned unclaimed from former mine office, Williams, Coconino county, Arizona.

PEWABIC MINING CO.**MICHIGAN.**

Wound up. Lands now owned by Quincy Mining Co.

PEYTON CHEMICAL CO.**CALIFORNIA.**

Office: 430 Mills Bldg., San Francisco, Cal. Mine office: Eldorado, Eldorado Co., Cal. Property is the Noonday mine and adjoining claims, in the Diamond Springs district, the Noonday being held under bond and lease. Has shipped ore to the company's works at Peyton, Contra Costa county, California.

PHI DELTA THETA COPPER MINING CO.**WYOMING.**

Letter returned unclaimed from former mine office, Dillon, Carbon Co., Wyo.

PHILADELPHIA & ARIZONA MINING CO.**ARIZONA.**

Office: 614 Real Estate & Trust Bldg., Philadelphia, Pa. Mine office: Chloride, Mohave Co., Ariz. Organized 1900, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. H. T. Goodman, president; E. F. Lukins, secretary and treasurer; E. T. Loy, general manager; W. F. Miller, superintendent; F. R. Brooks, mill superintendent. Lands, in the Wallapai district, include the Minnesota, Merrimac, Connor, Manzanita and other mines, carrying sulphide ores in fissure veins averaging 6' width, with assay values of 1% to 20% copper, 15 oz. silver and \$6 gold per ton, with a little lead. Development is scattered over a number of different mines, including 20 shafts from 20' to 600' in depth, and a 3,500' tunnel. Has steam and electric power, 10-stamp mill, 150-ton concentrator and other necessary equipment, employing about 75 men. Property considered well managed and valuable.

**PHILADELPHIA COPPER & GOLD MINING,
MILLING & SMELTING CO.****MEXICO.**

Office: 317 Drexel Bldg., Philadelphia, Pa. Mine office: San Martin Hidalgo, Jalisco, Mex. Employs about 100 men. Organized 1900, under laws of New Jersey. Capitalization \$300,000, shares \$1 par. Edwin F. Hall, president; Dr. S. C. Runkle, vice-president; Francis J. Fee, secretary; Josiah G. Williams, treasurer; Augustine F. Paul, general manager; Michael J. Slattery, purchasing agent; Ernest Koch, mill superintendent; Braulio Medina, mining captain. Lands, 57 pertenencias, area 141 acres, also a 2-acre millsite, in the Ameca district, including the Ajax, La Perla, La Concha, San Vicente and other mines, showing 14 fissure veins, of which 2, carrying sulphide ores, are being developed on the Ajax, these averaging 12' width with estimated average values of 7% copper, 2 oz. silver and \$20 gold per ton. Has 8 shafts averaging 100' in depth, also 6 shallow shafts, with total of about 8,000' of underground openings. Has good steam power equipment,

40-ton Ellspass mill, 25-ton lixiviation plant and 30-ton concentrator, and plans installation of a 50-ton reverberatory furnace.

PHOENIX CONSOLIDATED COPPER CO.

MICHIGAN.

Office: 15 William St., New York. Mine office: Phoenix, Keewenaw Co., Mich. Employs about 250 men. Organized April, 1899, under laws of Michigan, with capitalization \$2,500,000, shares \$25 par, \$12 paid in. John R. Stanton, president; Wm. C. Stuart, vice-president; J. Wheeler Hardley, secretary and treasurer; Frank McM. Stanton, agent; preceding officers and J. Oppenheim, directors; Wm. A. Dunn, superintendent; Edw. Hall, mining captain; Dugald Stewart, clerk; American Loan & Trust Co., of Boston, transfer agent; Old Colony Trust Co., of Boston, registrar. Annual meeting, second Monday in March.

Official returns to the state of Michigan, as of date Jan. 1, 1904, disclose the following figures.

Amount cash paid in on capital stock.....	\$1,100,000.00
Amount paid in by conveyance of property to company..	500,000.00
Entire amount invested in real estate.....	505,000.00
Amount of personal estate.....	32,193.63
Amount of unsecured or floating debt.....	107,133.24

The Phoenix Consolidated lineally succeeds the Lake Superior Copper Co., which was the first regularly organized corporation to engage in copper mining in the Lake Superior district. The history of the Phoenix under previous managements is given at length in Vol. II.

Lands, 2,505 acres, being Sections 19 and 20, west half of each of Sections 17, 20 and 29, and fractional Section 18, all in T. 58 N., R. 31 W., including the old Phoenix proper, the St. Clair and Garden City mines and 80 acres of the Atlas tract. Lake Superior lies on the north, the Meadow, Humboldt and Eagle River properties on the east, Atlas and Union on the south and the Cliff mine of the Tamarack on the west. Five different fissure veins have been opened on the consolidated property, these being known as the Phoenix, East Phoenix, Armstrong, Ward and Robbins, or West Vein. The Phoenix proper, not worked now, was opened, 1844, on the Phoenix fissure, and closed 1886, securing a total output of 7,773 tons, 39 lbs. of refined copper, this including the largest mass of native copper ever found, weighing upwards of 500 tons. From 1873 to 1877 the mine made money and paid one \$20,000 dividend. For the 14 years 1872-1885 the yield of refined copper was 473 lbs. per fathom stoped, or approximately 27 lbs. per ton. The Phoenix vein averages 3' to 6' wide, with nearly vertical dip, and strike of N. 5° W., with two practically vertical shafts, the Tyler, 300' deep and the Crocker, 780' deep, also an incline from the Tyler shafthouse following the dip of the stratified beds, with depth equivalent to 1,000' vertically, this shaft nearly paralleling the "false slide" that underlies the greenstone.

Some 20 cupriferous fissures, mostly narrow and of small promise, have been opened on the lands of the present company since 1844. The Allouez conglomerate, found under the greenstone both east and west of the Phoenix is missing here, as are sundry other amygdaloid and conglomerate strata

noted on either side. The Garden City mine was operated 1859 to 1868, and the St. Clair was worked 1865 to 1874, and 1880 to 1885, these mines having a joint productive record of 543 tons, 468 lbs. fine copper.

The Ashbed lode outcrops about 200' from the mill, and this may be reopened when the Keweenaw Central railway is built, affording cheaper costs for development work. The Ashbed has been opened by a 400' adit, and proves to run 5' to 25' in width, with some old stopes looking fairly well, but the lode as a whole is decidedly bunched.

The St. Clair fissure vein is 12" to 6' wide, with an average width of 18" to 24" and a dip of 84° with a strike of N. 15° W. The mine is very dry, not making enough water for the boilers on surface. The shaft is 8x12' inside of timbers, with one skipway and a compartment for pipes and ladders. The mine was opened awkwardly by a nearly vertical 400' shaft, from the bottom of which a drift ran 700' north to the "false slide" on which a winze or blind shaft was sunk at an angle of 45°, and from which drifts were opened north on each level to the "true slide" underlying the greenstone at an angle of 27°. This awkward opening was remedied by hoisting the blind shaft through to surface by an upraise. The completed incline shaft, entirely superseding the old shaft, leaves surface at an angle of 32° and on the fourth level, at the depth of 725', changes to 42°, running to the eleventh level, a total depth of 1,710'. A drift-crosscut, the opening being a drift on the fissure vein and a crosscut on the formation, was driven 2,090' south from the greenstone, on the fourth level, of the St. Clair shaft, giving a complete cross-section of the rock strata and showing sundry mineralized beds, of which the most promising was a 40' amygdaloid cut some 60' south of the old vertical shaft. The skip in this shaft does not reach surface, connecting with a gravity tram running over a 300' trestle and through a short tunnel to the permanent rockhouse, built 1904. At the close of 1904 the St. Clair was showing very well, having a 5' vein at the bottom that was uniformly productive of heavy copper and stamp-rock. Owing to the narrow veins, "baby" drills are employed, these using $\frac{3}{4}$ " steel and weighing but 100 lbs. without lugs, permitting their easy handling in four-foot stopes and obviating the breaking of considerable wall-rock, which would be unavoidable in the use of power drills of ordinary size.

The West vein, formerly known as the Robbins, is 3' to 6' wide with nearly vertical dip and strike of N. 16° E., corresponding in dip and strike with neither fissures or stratified beds. The old vertical shaft was cut down, retimbered and sunk to 1,000' depth. Drifts on the fissure to north and south cut numerous amygdaloid beds, these yielding good mass and stamp copper at their intersections with the fissure. An amygdaloid bed, opened on the eighth level by a south drift, gave a 7-ton mass late in 1903. This shaft has about one mile of stoping ground opened and is equipped with a good surface plant, including a remodeled hoist, boilers, Ingersoll-Sergeant air compressor and a new rockhouse with 18x24" crushers. The showing was satisfactory until the last two levels, when the vein widened to 12', but carried no more copper than when but 5' wide. The shafthouse burned

in 1904 and was replaced with a temporary wooden headgear. All work was discontinued in September, 1904.

The shops, built 1902, are under one roof, and have the following dimensions: machine shop, 30x60'; power house, 24x42'; carpenter shop, 30x60'. There also is a substantial office, store, warehouse, barns and a number of new and remodeled dwellings, the mine location being an exceptionally handsome one. The company has a private telephone exchange, connecting all departments of the mine and mill. Water for mine and domestic uses is taken from a 3,000,000-gallon dam, 12' deep with area of 300x700', built across the Eagle river. A large stationary Worthington pump in the railroad roundhouse connects with the dam, and has 900' of hose for fire protection. Mine and mill are connected by a $3\frac{1}{2}$ mile narrow-gauge railroad, equipped with one locomotive, rock-cars and flat-cars.

The stamp mill, 50x190', of wood, on concrete foundations, is located on Eagle river, about $2\frac{1}{2}$ miles north of the mine. The mill has an 18x24" stamp, with 24 Hodge jigs, 6 finisher jigs, 2 Wilfley tables and 8 Overstrom tables. The mill has a daily capacity of about 325 tons and was put in commission Oct. 1, 1903. Wash-water is secured from a wooden dam 90' wide and 10' high, with a 12x24" launder leading to the mill, this having a fall of 13' in a distance of 3,000'. Mine and mill are connected by the Phoenix Railway, a 2-mile narrow-gauge line built and owned by the company. Production in 1904 was 1,162,201 lbs. fine copper and 13,375 oz. fine silver, sold for \$161,684.91. Expenses for the year were \$245,381.40, of which \$13,773.43 were for construction account. Copper, refined electrolytically by the Nichols Chemical Co., yielded an average of 46.5 oz. silver per short ton. The company has an excellent management, and results for 1905 should be better than were secured in 1904, especially if the new Keweenaw Central railway is built, as this line would give the Phoenix the benefit of direct rail communication with the outside world, the lack of which means higher costs in every department of the mine and mill.

PHOENIX GOLD MINING CO.

CALIFORNIA.

A reorganization, under a new name (because the old one smelled to high heaven) of the Mt. Shasta Gold Mines Corporation. Property is an alleged gold mine, etc.

PHOENIX MINE.

AUSTRALIA.

Mine office: Cobar, Robinson Co., N. S. W., Australia. A prospect.

PIC COPPER & GOLD MINING CO. OF

ONTARIO.

LAKE SUPERIOR, LTD.

Neither office nor lands of company can be located. Property was advertised as "directly north of the Calumet & Hecla," which was a very misleading statement, as lands are supposed to have been on the Canadian shore of Lake Superior.

PICACHO-BLANCO MINING CO.

ARIZONA.

Mine office: Morristown, Maricopa Co., Ariz. Is a consolidation of the San Domingo Gold & Copper Co. and Exposition Mining Co., with capitalization \$5,000,000, shares \$1 par. M. E. Waldstein, president; T. O. Otis,

secretary and treasurer. Lands, 31 claims, in Yavapai and Maricopa counties, Arizona. Has a 400' main shaft, with free-milling gold ores said to average \$22 per ton. Has gasoline power, 15-stamp mill and 25-ton cyanide plant.
MINAS PICACHO y CAMPO RICO. **MEXICO.**

Mine office: Bavispe, Sonora, Mex. B. J. Hone, manager. Ores carry copper, gold, silver and lead. Has water power, arrastras and small adobe smelter.

FELIX R. PICASSO.

PERU.

Office and mine: Cabeza Negra, Ica, Peru.

PIEDMONT COPPER MINING & SMELTING CO.

VIRGINIA.

Office: 320 Broadway, New York. Mine office: Elkton, Rockingham, Co., Va. Organized 1901, under laws of New Jersey, with capitalization \$2,000,000, shares \$100 par, \$30 paid in. Maurice D. Brown, president; Jas. G. Blauvelt, vice-president; E. Porter Emerson, secretary and treasurer; S. D. Brown, general manager. Property shows 3 fissure veins carrying occasional native copper and sulphide ores, giving estimated average values of 6% copper, 10 oz. silver and \$15 gold per ton. Veins said to be persistent and traceable for about a mile, with geological conditions much the same as at the High Top mine, adjoining. Idle.

PIEDRA y CA.

CHILE.

Office and mine: Caldera, Atacama, Chile. Mine has steam power and employed about 100 men at last accounts.

PIEDRAS VERDES MINING CO.

MEXICO.

Office: El Fuerte, Sinaloa, Mex. Has argentiferous copper ores, slightly developed by tunnel.

COMPANIA MINERA PIEDRAS VERDES y ANEXAS.

MEXICO.

Mine office: Alamos, Sonora, Mex. Angel Almado, president; Joaquin A. Mange, superintendent. Has copper ores developed by a 350' shaft and 375' tunnel. Has steam power. Made several small shipments of matte averaging 40% copper, 20% lead and 200 oz. silver per ton, in 1902. Employed about 75 men at last accounts.

PIERCE MINING CO.

COLORADO.

Mine office: Central City, Gilpin Co., Colo. Stephen Hoskin, manager. Ores carry gold, silver and copper. Has steam power and employs 10 men.

NEGOCIACION MINERA DE PILARES DE TERAS.

MEXICO.

Mine office: Pilares de Teras, Sonora, Mex. Alberto C. Garcia, superintendent. Is primarily a silver mine, carrying small values in copper, gold and lead, opened by a 1,400' tunnel and 700' main shaft. Has steam power and employs about 200 men.

PILOT KNOB COPPER MINING CO.

NEVADA.

Letter returned unclaimed from former office, Eau Claire, Wis. Lands supposed to be in Nevada. Undoubtedly idle and presumably moribund.

LES MINES DE CUIVRE PILOU, LTD.

NEW CALEDONIA.

Entire stock issue held by Caledonia Copper Co., Ltd.

PINAL COPPER CO.

ARIZONA.

Office: 1103 Fullerton Bldg., St. Louis, Mo. Mine office: Globe, Gila

Co., Ariz. Organized under laws of Arizona, with capitalization \$2,000,000, shares \$10 par. Jos. F. Langler, president; A. L. Steinmeyer, secretary; Chas. A. Lemp, treasurer; G. P. Andrews, manager; Leslie C. Mott, superintendent. Lands, 160 acres, 8 miles northwest of Globe, known as the Black Copper group, developed by 10 shafts and tunnels and claimed to have 20,000 tons of 10% to 15% ore in sight. Last work was done in 1901, when small ore shipments were made to El Paso smelters.

PINE HILL CONSOLIDATED MINING CO.

CALIFORNIA.

Office: 1316-141 Broadway, New York. Mine office: Wolf, Nevada Co., Cal. J. Frank Mase, secretary and treasurer; Cerf Rosenthal, superintendent. Has a copper ledge, claimed to be 100' wide, carrying azurite, malachite, bornite, chrysocolla and native copper, with a gold vein on the footwall and an auriferous gossan capping, opened by a two-compartment main shaft. Also has a gold mine, quite extensively developed.

PINKHAM MINE.

ARIZONA.

Letter returned unclaimed from former mine office, Chloride, Mohave Co., Ariz.

RODOLFO PINOCHET.

CHILE.

Office and mine: Lo Espejo, Santiago de Chile. Operates the Vieja copper mine. Has steam power and employs about 150 men.

PINTO COPPER CO.

NEW MEXICO.

Office: 9 Bartles Bldg., Iola, Kan. Mine office: Santa Rita, Grant Co., N. M. Organized July, 1902, under laws of South Dakota, with capitalization \$2,500,000, shares \$1 par. Geo. A. Bowlus, president; F. S. Bennett, secretary and general manager; Samuel Allen, superintendent. Lands, 8 claims, area 121 acres, in the Central district, showing 4 veins carrying carbonate and sulphide ores said to average 20' width and to carry 2.5% to 12% copper, 3 oz. to 10 oz. silver and \$2 to \$400 gold per ton. Opened by shafts of 65', 70', 75', and 140'.

PINTO CREEK COPPER CO.

ARIZONA.

Title changed to Arizona & Hancock Mining Co.

PINTO CREEK MINING & SMELTING CO.

ARIZONA.

Office: 501 German American Bank Bldg., St. Joseph, Mo. Mine office: Globe, Gila Co., Ariz. Organized Dec. 11, 1896, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Thos. G. Cockrill, president; Grant S. Watkins, secretary; J. W. Castle, treasurer; D. P. Fuller, superintendent. Lands, 14 claims, area 280 acres, in the Globe district, showing 3 fissure veins of 3' to 4' width carrying sulphide ores giving assays of 4% to 12% copper, 5 oz. silver and \$2 to \$4 gold per ton. Main development is on the Yo Tambien claim, which has a 570' shaft showing a promising body of sulphide ore, with a 70' shaft on the Manitou claim and 3 tunnels of 1,500' aggregate length, giving upwards of 3,000' of underground openings. Has gasoline power, 10-stamp mill, 30-ton concentrator and an aerial tramway connecting mine and mill. Regarded as a promising property.

PIT RIVER GOLD, SILVER & COPPER MINING CO.

CALIFORNIA.

Mine office: Redding, Shasta Co., Cal. Presumably idle.

PITKARANTA KOPPARBRUK.**FINLAND.**

Mine office: Pitkaranta, Veburg, Finland. Ore is chalcopryrite with sahlite gangue, traversing granite. An ancient property and a small but steady producer, making about 750,000 lbs. fine copper yearly.

PITTSBURG & ARIZONA MINING CO.**ARIZONA.**

Lands, sundry mining claims near Charleston, Cochise county. Arizona.

PITTSBURGH & BOSTON COPPER CO.**MICHIGAN.**

Wound up. Property, the Cliff mine, now owned by Tamarack Mining Company.

PITTSBURG & CHIRICAHUA DEVELOPMENT CO.**ARIZONA.**

Mine office: Paradise, Cochise Co., Ariz. Lands, 16 claims, in the Chiricahua Mountains.

PITTSBURG CONSOLIDATED MINING CO.**UTAH.**

Office: care of J. E. Hill, Jr., secretary-treasurer, Salt Lake City, Utah. Organized 1903, with capitalization \$300,000, shares \$1 par. S. M. Levy, president. Lands, 9 claims in the Little Cottonwood district of Salt Lake county. Idle at last accounts.

PITTSBURG COPPER MINING & REDUCTION CO.**ARIZONA.**

Office: 300 Heist Bldg., Kansas City, Mo. A swindle, promoted by Theodore Stegner, a notorious promoter of crooked mining schemes. Company held 40 acres of alleged copper mining ground in Box Canyon, on the Bill Williams Fork river, about 50 miles from Congress Junction, Arizona, and also claimed to own other lands, none of which can be located. Company is capitalized at the preposterous sum of \$150,000,000, and the shares are absolutely worthless.

PITTSBURG & DULUTH DEVELOPMENT CO.**ARIZONA.**

Succeeded, October, 1904, by Pittsburg & Duluth Mining Co.

PITTSBURG & DULUTH MINING CO.**ARIZONA.**

Office: Calumet, Mich. Mine office: Bisbee, Cochise Co., Ariz. Employs 60 men. Organized October, 1904, under laws of Minnesota, as successor of the Pittsburg & Duluth Development Co., with capitalization \$3,000,000, shares \$10 par, \$3 paid in, and balance of \$7 payable, \$3 Feb. 15, \$2 Feb. 25, and \$2 June, 1905. Chas. Briggs, president; Capt. James Hoatson, vice-president; Peter Ruppe, treasurer; Gordon R. Campbell, secretary; Samuel A. Parnall, superintendent; preceding officers, Thos. F. Cole, Chester A. Congdon, Chas. d'Autremont, Jr., Thomas Hoatson and George E. Tener, directors; H. A. Smith, engineer; Henry B. Paull, clerk; J. R. Silvia, mine foreman.

Lands, 12 claims, area circa 200 acres, owned in fee. Property is surrounded by lands of the Copper Queen, Calumet & Arizona, Lake Superior & Pittsburg and Wolverine & Arizona, two of which rank among the ten largest copper producers of the world, while the third is soon to join the same class and the fourth, while yet lacking ore, has very bright prospects. The mine is opened by a shaft of 1,200' depth, on the Black Bear claim, only 650' from the Calumet & Arizona line, and by a drift-crosscut from the 1,000' level of No. 2 shaft of the Lake Superior & Pittsburg, and, owing to

the very rugged topography of the company's lands, can produce to better advantage through the L. S. & P. shaft than through any shaft that can be sunk on its own lands. The collar of the shaft is 150' above the collar of the Irish Mag shaft of the Calumet & Arizona, hence an allowance of 150' must be made in correlating P. & D. levels connected with C. & A. openings. The shaft will connect, in 1905, with the drift-crosscut run in from the 1,000' level of No. 2 shaft of the L. S. & P., and also with a drift-crosscut from the Irish Mag shaft of the C. & A.

Considerable ore has been cut at various points, especially on the 1,000' level drift from the Lake Superior & Pittsburg, but the work done to date has been performed more with an idea to opening the mine than to showing big ore bodies. The ore already cut is sufficient in quantity and quality to guarantee the success of the Pittsburg & Duluth. Several ore bodies, apparently merely apexes of large lenses lying lower, have been cut on the 1,000' drift-crosscut, these ranging 5% to 12% in copper tenor, being mainly chalcopyrite, with considerable oxidized ore and native copper. In addition to these lenses, diamond drill borings have cut several other ore bodies, apparently richer and larger, and a large body of high-grade ore is known to underlie the Sunnyside claim at a depth of about 1,500'.

Equipment is of a temporary nature only, including hoists, 6-drill air-compressor, boilers, etc. The Pittsburg & Duluth has the same local and general management as the Calumet & Arizona, than which nothing could be better, and is a property of exceptional promise, with an assured future.

**PITTSBURG-JEROME COPPER & GOLD
MINING CO.**

ARIZONA.

Office: Pittsburg, Pa. Mine office: Jerome, Yavapai Co., Ariz. Organized 1904, under laws of Arizona, with capitalization \$1,500,000, shares \$1 par. Wm. A. Edeburn, president; Thomas H. Houlette, vice-president; S. B. Whinnery, secretary and treasurer; W. A. Edeburn, consulting engineer; D. S. Cochran, engineer.

Lands, 15 claims, formerly known as the Larson-Avery group, lying about midway between the United Verde and Equator mines, at an average distance of 2 miles from each. Development is by a 130' shaft, showing leached ore carrying small quantities of carbonate and sulphide ores. It is intended to sink 500' before drifting, which is a sensible plan. Machinery will be installed in 1905, on completion of a new wagon-road from Yaeger, on the Prescott & Eastern railway, 10 miles distant. This is a legitimate enterprise, backed by strong people, and its lands are exceptionally well located.

PITTSBURG & MONTANA COPPER CO.

MONTANA.

Office: 401 Tradesmen's Blk., Pittsburg, Pa. Mine office: Butte, Silver Bow Co., Mont. Is a close corporation, with lands and improvements all paid for, and asks neither cash nor notoriety. J. H. Reed, president; D. E. Jackman, secretary and treasurer; Ralph L. Baggaley, manager; Wm M.

Kirkpatrick, superintendent; C. M. Allen, smelter superintendent. Lands, circa 267 acres, on the flat adjoining Anaconda hill, about 2 miles east of the center of Butte, including the McQueen placer, and adjoining claims formerly owned by Franklin Farrell. Tract is about $1\frac{1}{4}$ miles long, north and south, a quarter mile wide at its narrowest point and about $\frac{3}{4}$ mile wide at a point adjoining the Silver Bow mine. In addition to this main property in Butte, the company bought, in 1903, the Swissmont mines, near Elkhorn, Jefferson county, and the Chamounix property, near Austin, Choteau county, Montana. The Austin property includes the Christina group of 7 claims and the Fannie Parnell group of 33 claims, near Austin, 15 miles from Helena, the Christina group having considerable development and having shipped more or less argentiferous copper ore. The property is to be extensively developed for pyritic ores, required in connection with Butte ores, which, being largely chalcocite and enargite, rather than chalcopyrite, are somewhat deficient in sulphur. The Elkhorn properties, bought for \$60,000, show a large body of low-grade pyritic ore, carrying 1.5% to 3% copper, of a grade and character especially adapted to ideal pyritic smelting.

The Butte mine, formerly known as the McQueen and the Farrell, has silicious sulphides, supposed to be a continuation of the veins of the Butte & Boston. Owing to the great depth of overburden, the solid ledge was not reached until a depth of several hundred feet, and shaft sinking was difficult owing to the existence of considerable quicksand above the ledge. No. 2 shaft, 1,240' deep, has a hoist good for 1,500', with large pump-stations on the 700' and 1,200' levels, equipped with 500-gallon pumps. No. 3 shaft, also is permanently equipped, and is 1,240' deep. The shafts each have considerable development, and are being connected by a crosscut of 2,600' on the 1,200' level. The principal vein of the mine is about 30' wide, carrying chalcocite running 6% to 17% copper. No. 3 shaft shows 3 veins, ores of which assay up to 50% copper tenor, with an average of 5% to 6%. All of the copper ores carry both gold and silver values.

The reduction plant, known as the Pittsmont smelter, connected by track with the north shaft, is very substantially built, with room for three 400-ton furnaces and 4 smaller furnaces. The Garretson pyritic process is not used, Mr. Baggaley stating that that process is a failure. The Pittsmont smelter employs a modified form of pyritic smelting, known as the Baggaley process, and turned out its first metal in February, 1904, the product being a blister copper of high purity and electrical conductivity. By this process ores are reduced without concentration or calcination. Handling of material is nearly automatic throughout, the plant being designed with a close eye to economy in labor. In operation the plant experienced the trouble, apparently common to all process of pyritic smelting, of charges freezing in the furnace, but this seems to have been overcome. At the close of 1905 the smelter was being partially rebuilt and a converter plant added.

The company has a water-power near Woodville, Jefferson county, Montana, which may be improved later. Surface improvements at the

mine and smelter include a handsome office building, equipped with library, reception-room, billiard-room and café. The Pittsburg & Montana has not asked for public subscriptions to its shares, and is a business enterprise in which the officials are the principal shareholders. While its Butte mines do not seem as rich or as extensive as some of the leading mines of that camp, the Pittsburg & Montana unquestionably has large bodies of medium to high-grade ores. The management is good and the property is valuable.

PITTSBURG MINE. COLORADO.

Mine office: Central City, Gilpin Co., Colo. Peter McFarland, superintendent. Ores carry gold, silver and copper. Has steam power

PITTSBURG MINING & MILLING CO. IDAHO.

Letter returned unclaimed from former mine office, White Bird, Idaho Co., Idaho.

PITTSBURG & MOUNT SHASTA GOLD MINING & MILLING CO. CALIFORNIA.

Mine office: Redding, Shasta Co., Cal. B. N. Scott, president; John Parish, secretary. Lands are the Bennington group, adjoining the Mountain Copper Co., showing ores assaying from \$4 to \$300 per ton in gold, silver and copper. Property idle at last accounts, but considered promising.

PITTSBURG & UTAH GOLD, SILVER, COPPER & LEAD MINING CO. UTAH.

Lands supposed to be in the Ophir district of Tooele county, Utah.

PLAKALNITZA MEDNA PLANINA. BULGARIA.

Office: care of M. Mavrokordato, owner, Constantinople, Turkey. Mine office: Plakalnitza, Vratza, Bulgaria. Lands are sundry claims, held as a concession from the Bulgarian principality. Property shows bornite and a little chalcopryite, in dolomite. Copper mines were worked in this vicinity by the Romans.

PLANET COPPER MINING CO. ARIZONA.

Office: 170 Broadway, New York. Mine office: Planet, via Yucca, Yuma Co., Ariz. Organized August 14, 1902, under laws of Arizona, with capitalization \$1,500,000, shares \$10 par J. Stanley Jones, president; Geo. H. Kimball, secretary; H. L. McCarn, superintendent. Lands, 20 claims, area 400 acres, also 35 acres in millsites and miscellaneous lands, in the Harewan district, on the Bill Williams fork of the Colorado river. Ore occurs as bedded veins and lenses, with about 50 different exposures, veins being contacts between diorite and sedimentary shales. Four ore bodies are being developed, these showing oxide, carbonate and silicate ores, the sulphide zone not having been reached, giving average assays of upwards of 10% copper, without gold or silver values. Mine has about 3,000 tons of ore on the dumps, with about 10,000 tons blocked out for stoping.

Mine was opened 1863-1864, and was worked again in a small way in 1874 and 1884, and was reopened by present owners in 1902. Development is by 12 shafts of 20' to 120' in depth, 3 inclines of 185', 290' and 325', and 8

tunnels, longest 225', with about 2,000' of underground openings. Has 12-h. p. and 22-h. p. Fairbanks & Morse gasoline hoists. Surface improvements include a smithy, assay office, boarding-house and 3 dwellings, also a smelter with a 30-ton round cupola, not in blast. The company plans continuing the incline on a contact vein until the sulphide zone is reached, and installation of air compressor and power drills, deferring building of a smelter until the nature of the sulphide ores is determined. This property has produced upwards of \$500,000 worth of high-grade ore, ranging from 15% to 40% in copper, and is regarded as valuable.

PITTSBURG & HECLA DEVELOPMENT CO.

ARIZONA.

Office: 1110 Farmers Bank Bldg., Pittsburg, Pa. Mine office: Bisbee, Cochise Co., Ariz. Employs about 20 men. Organized 1903, with capitalization \$400,000. Wm. C. Temple, president; D. H. Collins, general manager; Thos. Tate, superintendent. Lands are the Gold Hill group in the Solomon Springs district, about 3½ miles southeast of Bisbee. Lands show a limestone formation with considerable iron ore and much manganese, giving indications of copper ore values underneath. Development is by a 575' two-compartment shaft, with drifts on the 200' level. Equipment includes an 80-h. p. steam plant with double-drum hoist, office building, boarding-house, bunk-house and several dwellings. Sinking was suspended, circa June, 1904, and borings begun with a diamond drill.

PLATA COBRE MINING & TRANSPORTATION CO.

ARIZONA.

Office: 415 Jackson Bldg., Denver, Colo. Mine office: Shultz, Pinal Co., Ariz. Wm. R. Benzie, president; John M. Shrote, secretary and treasurer; A. R. Benzie, superintendent. Lands include the Christmas Gift property, south of Casa Grande, bought September, 1903, ores of which carry silver, copper and gold.

PLATA COPPER MINING CO.

Promoted by the notorious Wernse gang. Utterly worthless.

MINA LOS PLATINOS.

MEXICO.

Letter returned unclaimed from Fuerte, Sinaloa, Mexico.

PLATTE CAÑON MINING CO.

WYOMING.

Mine office: Wheatland, Laramie Co., Wyo. Thos. Hunton, Supt.

PLENTY COPPER CO.

ARIZONA.

A stock peddling scheme promoted by the Wernse gang of swindlers. Claimed to have lands in Pima county, Arizona. Utterly worthless.

PLUMAS COPPER MINING & SMELTING CO.

CALIFORNIA.

Letter returned unclaimed from former mine office, Susanville, Plumas Co., Cal.

PLUMAS MINING, MILLING & SMELTING CO.

CALIFORNIA.

Organized May, 1902, with capitalization \$200,000, by A. Dragovich, et al, of San Francisco, to build a smelter at Taylorsville, Plumas county, California, but unknown at Taylorsville.

PLUTO GOLD & COPPER MINING CO.

WYOMING.

Office: care of H. O. Granberg, secretary and treasurer, Oshkosh, Wis. Organized Dec. 15, 1902, under laws of Wyoming, with capitalization

\$1,000,000, shares \$1 par. Ole Granberg, president; M. H. Grasberg, vice-president. Lands, 9 claims, area 182 acres, patents pending, lying near the Ferris-Haggarty, developed by several shafts of 20' to 93' depth, and a 631' working tunnel, showing oxide and sulphide ores of copper, associated with manganese. Has steam power. Management considered good and property promising.

PLYMOUTH ROCK MINE.

CALIFORNIA.

Mine office: Milton, Calaveras Co., Cal. T. T. Lane, owner; A. W. Collins, superintendent. Ores carry gold, silver, lead and copper. Has water-power and 10-stamp mill, employing 10 to 15 men.

POCAHONTAS MINE.

CALIFORNIA.

Office: care of Mrs. Abby Waller, owner, Merced, Mariposa Co., Cal. Lands, 160 acres, showing several veins of cupriferous iron ore, between dioritic walls, vein matter being mainly diabase and altered diabase. Principal vein is about 100' wide and the mineral belt is 1,000' wide in places. Ore bodies, in lenses, are said to carry 6% to 12% copper and \$2.50 gold per ton. Has been a limited producer of high-grade carbonate and oxide ores, above the 100' level, ore below being sulphide.

POCATELLO GOLD & COPPER MINING CO.

IDAHO.

Office and mine: Pocatello, Bannock Co., Idaho. Employs 3 men. Organized Dec. 1, 1902, under laws of Idaho, with capitalization \$1,000,000, shares 50 cents par. E. Craanson, president; J. J. Guheen, secretary; N. M. Eldredge, general manager; Jos. E. Munn, superintendent. Lands, 7 claims, area 140 acres, including the Moonlight claim, in the Fort Hall district, showing a vein of about 3' average width, said to give assays of 40% copper and 75% lead (total 115%) with 35 oz. silver and \$1 gold per ton, from bornite and chalcopyrite. This evidently is very rich ore, as veins carrying 115% in metallic values are unusual, even in Idaho. Company shipped some ore, 1903-1904, to the White Knob smelter, same being found a desirable flux for the White Knob ores.

POLAND EXTENSION GOLD MINING & MILLING CO.

ARIZONA.

Office: 401 Henne Blk., Los Angeles, Cal. Mine office: Poland, Yavapai Co., Ariz. Chas. J. George, president; M. C. Nichols, secretary; John G. Gray, superintendent. Ores carry copper, lead and zinc. Has steam power and plans installing a 50-ton mill. Employed about 20 men at last accounts.

POLARIS MINING & MILLING CO.

ARIZONA.

Office and mine: Clifton, Graham Co., Ariz. J. B. Schmitz, president. A. S. Eyler, secretary; E. W. Beauchamp, general manager. Lands, 19 claims, laying northeast of the Clifton Consolidated and New England. Country rock is granitic, ore bodies occurring near parallel porphyritic dykes, with oxide, carbonate and altered sulphide ores, associated with gold-bearing quartz, and having a clay gangue. Shows auriferous and argentiferous chalcopyrite in the lower workings. Has steam and gasoline power and a 20-stamp mill. Property regarded as promising.

PONDILLAI & VOLCAN GROUP.

NEW CALEDONIA.

Mine office: Diahot, New Caledonia. Slightly developed prospects.

PONTIAC GOLD & COPPER MINING CO.**NEW MEXICO.**

Letter returned unclaimed from former mine office, Tres Piedras, Taos Co., N. M.

PONTIAC MINING CO.**VIRGINIA & NORTH CAROLINA.**

Office: 19 Liberty St., New York. Mine office: Virglna, Halifax Co., Va. Employs 16 men. Organized 1902, under laws of New York, with capitalization \$1,600,000, shares \$10 par. A. A. Sumner, president; Samuel Bryant, secretary; Robt. G. Lossiter, general manager. Lands, 1,340 acres, in the Virgilina district of Virginia and North Carolina, carrying a fissure vein in schist, opened by the Tuck shaft of 125' and the Glasscock shaft of 203', showing cuprite, malachite and azurite to depth of 60', below which are chalcocite, bornite and chalcopyrite, with quartz and epidote gangue, giving average assays of 4% copper and 1 oz. to 2 oz. silver per ton, with traces of gold. Has gasoline power.

POOLE GROUP.**ARIZONA.**

Mine office: Washington, Santa Cruz Co., Ariz. E. M. Ray, superintendent. Ores carry copper, gold, silver and lead. Has steam power.

POONA & MATTA DARRA MINES.**AUSTRALIA.**

Office: care of C. H. Hussey, Broken Hill Chambers, Adelaide, South Australia. Lands are 240 acres, adjoining the Moonta mine, on the Yorke Peninsula, South Australia. Has shafts of 120' and 228', showing rich ore in promising quantities.

PORCUPINE MINE.**COLORADO.**

Office: Ashcroft, Pitkin Co., Colo. M. B. Sweeney, owner.

PORTAGE LAKE & BISBEE MINING CO.**ARIZONA.**

Office: 12 First National Bank Bldg., Hancock, Mich. Mine office: Bisbee, Cochise Co., Ariz. Organized April, 1903, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par, succeeding the Portage Lake & Calumet Development Co. W. S. Cleaves, president; John Funkey, vice-president; W. I. McMaster, secretary; Chas. Lewis, treasurer. Lands, 9 full and 3 fractional claims, area 200 acres, patented and owned in fee, 3 miles southeast of Bisbee, with boundary line 1,800' southeast of Calumet & Cochise. Formation is limestone, with a porphyry contact. Has a 302' shaft with two compartments, each 4' 6" square and well timbered. Has a small air-compressor, Worthington sinking pump, 75-h. p. hoist, boarding-house, bunk-house and smithy. Extensive diamond drilling was done, 1903-1904, and considerable leached ore cut, the work of the drill, while not proving workable ore bodies, being of an encouraging nature. Property idle, and company being practically out of funds, reorganization is proposed.

PORTAGE LAKE & CALUMET DEVELOPMENT CO.**ARIZONA.**

Reorganized, April, 1903, as Portage Lake & Bisbee Mining Co.

PORTLAND COPPER MINING CO.**WYOMING.**

Mine office: Battle, Carbon Co., Wyo.

PORTLAND (ROSSLAND) MINE, LTD.**BRITISH COLUMBIA.**

Merged, 1904, in Velvet-Portland Mine, Ltd.

PORTLAND MINING CO.**BRITISH COLUMBIA.**

Office: 19 North Seventh St., Terre Haute, Ind. Mine office: Aspen Grove, B. C. Organized 1901, under laws of British Columbia, with capitalization \$15,000, shares 1 cent par. Andrew J. Crawford, president; M. T. Hidden, secretary; J. E. Bate, general manager. Lands, 4 patented claims, area 204 acres, also 160 acres miscellaneous lands, in the Aspen Grove district, showing 10 veins, of which 2 under development give assays of 15% copper, 3 oz. silver and 80 cents gold per ton, from carbonate and sulphide ores. Has a 155' shaft and 32' tunnel.

PORTLAND-IMNAHA COPPER MINING CO.

Disincorporated, September, 1902, with all debts paid.

PORVENIR DE SONORA CO.**MEXICO.**

Reorganized, 1902, as Coast Line Copper Co.

POSTAL GOLD, PLATINUM & COPPER MINING CO.**WYOMING.**

Letter returned unclaimed from former office, 901-188 Madison St., Chicago, Ill. Mine office: Rambler, Carbon Co., Wyo. H. G. Richardson, president and general manager; B. J. Sommer, secretary. Lands, 5 claims, area 100 acres, in the Battle Lake district, 800' from the Doane-Rambler mine of the Battle Lake Tunnel Site Mining Co., opened by a 60' shaft and tunnel, with about 1,500' of underground openings, showing a ledge about 300' wide, from which a little native copper and covellite, assaying up to 55% copper and carrying gold and platinum, have been secured. Officers of company said to stand well, but all attempts to learn capitalization or secure other information have been ineffectual. Apparently idle.

COMPANIA MINERA POTOSINA.**MEXICO.**

Office: Apartado 68, San Luis Potosí, Mex. Mine office: Charcas, S. L. P., Mex. Carlos Uhden, manager. Operates the Guadalupe y Anexas mines.

MINA EL POTRILLO.**MEXICO.**

Mine office: Indé, Durango, Mexico. Victoriano Mantos, owner. Ores carry copper and silver. Has steam power.

NEGOCIACION MINERA DE POZOS.**MEXICO.**

Mine office: Pozos, Guanajuato, Mex. Operates Santa Brigida y Anexas, Santa Lucia and La Argentina mines, producing gold, silver and copper, latter as a by-product. Has steam power and employs several hundred men.

PRATT PYRITES MINES.**GEORGIA.**

Mine office: Dahlonega, Lumpkin Co., Ga. Ores are cupriferous and auriferous iron pyrites, carrying up to 2% copper and \$2 gold per ton. Management purposed installing a concentrator and acid plant, at last accounts.

PRESIDENTIAL MINING CO.**ARIZONA.**

Mine office: Patagonia, Santa Cruz Co., Ariz. W. C. Dumont, superintendent. Ores carry silver, lead and copper.

PRESTON PEAK COPPER CO.**CALIFORNIA.**

Office: 20 Broad St., New York. Letter returned unclaimed from

former mine office, Yreka, Siskiyou Co., Cal. Organized 1898, under laws of West Virginia, with capitalization \$2,500,000. Chas. A. Lieb, president; D. J. Newland, secretary. Lands, 5 claims, $1\frac{1}{2}$ miles north of Preston Peak. Country rock is diorite and ore bodies consist of a succession of lenses, some having a width of 20' to 30', carrying chalcopyrite disseminated in pyrite, said to average 10% copper, with small gold values.

PRIDE MINING CO.

COLORADO.

Dead.

PRIDE OF ARIZONA COPPER CO.

ARIZONA.

Dead. A Douglass Lacey promotion. See Amalgamated Gold & Copper Co. **PRIDE OF THE WEST MINING & MILLING CO.**

ARIZONA.

Office: 1801 Fifteenth St., Denver, Colo. Mine office: Washington, Santa Cruz Co., Ariz. Arthur R. Wilfley, president; Herbert E. Fiske, secretary. Organized May 1, 1901, under laws of Colorado, with capitalization \$1,500,000, shares \$10 par. Has paid one dividend of \$15,000. Lands, about 350 acres. Mine opened 1870; reopened 1897; closed 1902. Main shaft, about 300'. Ores carry silver, copper, lead and zinc. Has a 200-ton concentrator. Idle. Fully described in Volumes II. and III.

PRINCE MINING & DEVELOPMENT CO., LTD. **BRITISH COLUMBIA.**

Mine office: Revelstoke, Northwest Kootenay district, B. C. Owns the Standard group of 11 claims, with 1,300' of underground development. Vein is 5' to 8' wide, showing slightly auriferous and argentiferous chalcopyrite in pyrrhotite gangue, said to average 10% copper. Is developing each season, the working period being short, owing to high latitude and altitude of 7,000'.

PRINCESS ADA MINE.

WASHINGTON.

Office and mine: Marcus, Stevens Co., Wash. Chas. H. Alban, owner.

PRINCESS MAY MINE.

BRITISH COLUMBIA.

Office and mine: care of Charles Powell, owner, Princeton, Yale district, B. C. Lands, adjoining the Sunset, are slightly developed, showing low-grade copper ore giving assays of 2 to 10 oz. silver and \$1 to \$6 gold per ton.

PRINCESS ROYAL GOLD & COPPER MINING CO. **BRITISH COLUMBIA.**

Office: New Whatcom, Wash. Henry W. Parrot, president; Samuel D. Slentz, secretary. Lands, sundry claims on Princess Royal Island, ores from which have given assays very high in copper, with \$4 to \$10 gold per ton. Presumably idle.

PRINCESS ROYAL GROUP.

BRITISH COLUMBIA.

Office: care of Capt. John Irving, Victoria, B. C. Lands, 120 acres, showing a 4' vein with 18" to 24" paystreak carrying auriferous and argentiferous copper ores that have returned smelter values up to \$120 per ton. Under bond to James Findlay, et al, of St. John, N. B., at last accounts.

PRINCETON COPPER MINING & SMELTING CO.

ARIZONA.

Office: 39 Cortlandt St., New York. Mine office: Ft. Huachuca, Cochise Co., Ariz. Henry Hamburg, president and general manager; Henry C. Adams, vice-president and treasurer; Herbert N. Karner, secretary; C. S. Wright, superintendent. Organized 1901, under laws of South Dakota,

with capitalization \$2,500,000, shares \$1 par. Lands, 19 claims, well timbered, in the Hartford district, Huachuca Mountains, giving assay of 10% and upwards in copper and 10 oz. to 50 oz. silver per ton, with small gold values, from malachite, chalcocite and bornite. Adjoining gold claims of the company show high values in free-milling quartz. Has 4 shafts, deepest 80', and tunnels of 60', 70', 115' and 250'. Property, opened circa 1880, by Ben Williams, is near the Huachuca Consolidated. Company seems honestly and conservatively managed and property is regarded as promising.

PRO PATRIA MINING & MILLING CO.

COLORADO.

Mine office; Rico, Dolores Co., Colo. W. J. Scoutt, superintendent. Ores carry gold, silver, lead and copper. Has water and electric power and a 50-ton concentrator, and employed about 40 men at last accounts.

PRODIGAL SON MINE.

CALIFORNIA.

Office and mine: care of E. P. Loring, Cayucos, San Luis Obispo Co., Cal. Has limited development by shaft and tunnel, showing a vein of about 7', traversing syenite and serpentine and carrying auriferous and argenti-ferous chalcocite with quartz gangue.

PRODUCER MINING & SMELTING CO.

ARIZONA.

Office: 510-125 La Salle St., Chicago, Ill. Mine office: Casa Grande, Pinal Co., Ariz. J. W. McCoy, president; E. R. Zimmerman, secretary. Lands were the Jack Rabbit group of 80 acres, in Pinal county, the Producer and Century-Chief group of 320 acres and the Index group of 220 acres in Pima county, Arizona. Property in the Quijotoa Mountains was held under \$30,000 bond and lease, on which \$14,000 was paid before company learned that vendors lacked proper title. Main shaft, 200', with about $\frac{1}{2}$ mile of underground openings, said to show 52,000 tons of auriferous and argenti-ferous copper ore. Has a 50-ton smelter, nearly completed at last accounts.

MINA LA PROFUNDA.

SPAIN.

Mine office: care of Don Ruperto Sanz, León, León, Spain. Property includes La Profunda, Cármenes and one other property, which were working on a small scale at last accounts.

MINA EL PROGRESO.

MEXICO.

Mine office: care of A. E. Turner, owner, Sabinal, Chihuahua, Mex. Ores carry silver, copper and lead. Has steam power.

PROMONTORIO CONSOLIDATED MINING CO.

MEXICO.

Office: Nogales, Ariz. Leopold Ephraim, president; R. D. George, secretary. Lands are about 30 miles south of Nogales, in the Arizpe district of Sonora, Mexico. Ores are lead and copper sulphides, with gold and silver values. Was worked for about 12 years by Mr. Ephraim before formation of present company, high-grade ores being shipped to El Paso smelters and low-grade ores accumulated on dumps. Recent developments said not to have come up to expectations.

MINA PROMONTORIO.

MEXICO.

A copper-gold property, northwest of the city of Durango, Durango, Mex., said to be owned by an Anglo-German company, and to have large ore

bodies. Erected a 100-ton concentrator and small matting furnace, circa 1902.

PROMONTORIO MINING & SMELTING CO.

MEXICO.

Letter returned unclaimed from former mine office, Moctezuma, Sonora, Mexico, with notation by postmaster that no such company is in existence.

PROSPER GOLD MINING CO.

NEW MEXICO.

Mine office: Hillsboro, Sierra Co., N. M. A. J. Hirsch, manager. Ores carry gold, silver and copper. Has steam power.

PROSPERITY MINE.

ARIZONA.

Said, in 1902, to be under development in Copper Basin, Arizona.

MINA PROTECTARO.

MEXICO.

Office and mine: care of F. B. Najara y Ca., owners, Topia, Durango, Mex. Ores carry gold, silver and copper. Employs about 50 men.

PROVIDENCE GOLD & COPPER CO.

CALIFORNIA.

Office: 617 Homer Laughlin Bldg., Los Angeles, Cal. Mine office: Goldstone Camp, Fenner, via Blake, San Bernardino Co., Cal. P. H. Mathews, president; W. E. Baxter, vice-president and treasurer; A. Samuel Parks, secretary; F. H. Messmore, auditor. Organized November 2, 1901, under laws of Arizona, with capitalization \$3,000,000, shares \$1 par. Is free from debt and has a little cash on hand. Lands, 15 claims, also 8 millsites, area 339 acres, patents applied for, in the Arrow Weed district, showing 15 fissure veins carrying sulphide ores assaying about 1% copper and \$4 to \$1,000 gold per ton, with small silver values. Has several shafts, all under 100', with numerous pits and cuts, also tunnels of 155', 226' and 381', giving a total of 2,100' of underground openings. Will continue development work during 1905. Standing of management is excellent and property considered promising.

PROVIDENCE GOLD, SILVER & COPPER MINING CO.

ARIZONA.

Was organized by the joint efforts of Fanny Pogue, a colored woman of Tucson, Arizona, and Walter M. Roberts, et al., of St. Louis. Is a twin of the United Copper Mining Co., and apparently claims some ground that already is claimed by two or three sets of Lincoln mining companies.

MINA LA PROVIDENCIA.

MEXICO.

Mine office: Gavilanes, Durango, Mex. Anastasio Lugo, owner and manager. Has a 130' main shaft, developing argentiferous copper ores. Has water power, and employs about 40 men.

PRUDENTIAL COPPER MINING CO.

ARIZONA.

Office: 18 Custom House Pl., Chicago, Ill. Letter returned unclaimed from former mine office, Prescott, Yavapai Co., Ariz. Shea Smith, president; E. Haggott, consulting engineer. Presumably idle.

PRUDENTIAL GROUP.

CALIFORNIA.

Office: care of H. S. Reed, manager, Medford, Ore. Lands, near Shelly Creek, Del Norte Co., Cal., are opened to limited extent by shaft and tunnel, showing 2 veins of 25' to 30' width. Ore is pyrrhotite, carrying copper, gold, silver and zinc in small percentages.

PRUDENTIAL MINING & DEVELOPMENT CO.**ARIZONA.**

Letters returned unclaimed from former mine, Nogales, Santa Cruz Co., Ariz. Lands, 12 claims, adjoining the Buena Vista group of the Black Mountain.

PSYCHE MINING CO.**OREGON.**

Office: Omaha, Neb. Mine office: Greenhorn, Ore. J. Fawcett, manager. Ores carry gold, silver and copper. Has steam power and 20-stamp mill.

PTARMIGAN GROUP.**BRITISH COLUMBIA.**

Sundry claims at the head of McDonald Creek, an affluent of Horse Thief Creek, East Kootenay, British Columbia, showing slightly auriferous and highly argentiferous copper ores, opened by about 3,000' of tunnels and drifts. Has a 7,550' aerial tram.

PUERTECITO COPPER CO.**MEXICO.**

Owens no property; stock worthless.

PUGET SOUND COPPER MINES.**BRITISH COLUMBIA.**

Mine office: Van Anda, Texada Island, B. C. Wm. Law, superintendent. Has a copper ore body, with heavy gossan capping of fair-grade iron ore.

PUGET SOUND INVESTMENT CO.**BRITISH COLUMBIA.**

Letter returned unclaimed from former office, Irondale, Washington. Had copper claims near Gillies Bay, southwestern Texada Island, B. C.

PUGET SOUND REDUCTION CO.**WASHINGTON.**

Office and works: Everett, Snohomish Co., Wash. Has three 30x180' blast furnaces, one of which runs on copper ores, producing a matte averaging 50% in tenor, which is blown up to blister copper in a reverberatory furnace and shipped east for electrolytic refining. This plant is one of the two commercial producers of arsenic in the United States, making about five tons daily, from Monte Cristo ores.

PUGWASH CONSOLIDATED MINING & SMELTING CO.**NOVA SCOTIA.**

Office: 50 Congress St., Boston, Mass. H. H. Mansfield, treasurer. Company succeeded the Pugwash River Copper Co., which had 320 acres of land on the upper Pugwash river, Cumberland county, Nova Scotia. Property is said to show chalcocite in sandstone.

PUGWASH RIVER COPPER CO.**NOVA SCOTIA.**

Succeeded by Pugwash Consolidated Mining & Smelting Co.

PULIDO MINING CO., LTD.**PORTUGAL.**

Offices: 5-6, Great Winchester St., London, E. C., Eng. J. Silva, chairman; C. E. Wilkey, secretary. Capitalization, £165,000. Lands, 22 mineral concessions in the Baja district, province of Alemtejo, Portugal. Idle.

COMPANIA DE MINAS y FUNDICION DE PUQUIOS.**CHILE.**

Mine office: Los Puquios, Rancagua, Chile. Operates the Santa Rita, Ricardita, Morada and Magdalena mines, opened 1897, on a considerable scale. Has steam power and smelter, employing several hundred men.

PURITAN COPPER & GOLD MINING CO.**NEW MEXICO.**

A swindle, promoted by Benj. F. Coburn, who "guaranteed" 10% dividends for 5 years.

PYNE SMELTING CO.**CALIFORNIA.**

Office: 26 First National Bank Bldg., San Francisco, Cal. Works office: West Alameda, Alameda Co., Cal. P. W. Pyne, manager; Geo. H. Hand, superintendent. Works have a daily capacity of 100 tons, but were idle at last accounts, owing to litigation with gardeners in the vicinity. Company said to be reopening the Mackay-Ryan mine, near Stent, California.

PYRAMID COPPER CO.

Organized, 1902, with capitalization of \$500,000—\$300 paid in.

PYRAMID COPPER SYNDICATE, LTD.**BRITISH COLUMBIA.**

Offices: Moorgate Station Chambers, London, E. C., Eng. W. Smith, secretary. Capitalization, £20,000. Lands, 16 claims at Pyramid Camp, East Kootenay, British Columbia. Moribund.

PYRAMID GOLD & COPPER MINING CO.**ARIZONA.**

Office: 16 East King St., Lancaster, Pa., and 9, Lawler Block, Prescott, Ariz. Organized January, 1902, under laws of Arizona, with capitalization \$1,200,000, shares \$1 par. W. H. Ruffhead, president; H. C. Vincent, treasurer; C. A. Peter, secretary; A. J. Doran, consulting engineer. Lands, 12 claims, area circa 200 acres, 5 miles from Skull Valley station, country rock being granite-porphry, with gossan capping above veins carrying somewhat auriferous carbonate and sulphide copper ores, opened by several shafts of 50' to 110' depth. The Anna Bell claim has 100' of development work, said by company to show a dyke 150' wide, giving average assay of 14.5% copper and \$4.74 gold per ton from surface ores. Has a 10-stamp mill and 100-ton concentrator partly built, and is idle, owing to lack of funds.

PYRENEES COPPER MINES, LTD.**FRANCE.**

Wound up, August, 1904.

PYRENEES MINERALS, LTD.**FRANCE.**

Offices: 60, King St., Manchester, Eng. Organized May 5, 1902, with capitalization £160,000, shares £1 par; issued, £98,207. Debentures, £60,000 at 6%. W. Dearden, secretary; Isidore Tom, mine manager. Lands, 1,818 acres, including the Alzen silver and copper mines, in the department of Ariège, France. Has a 20-ton smelter. Idle.

PYRITE KING COPPER MINING CO.**SOUTH DAKOTA.**

Office: Pipestone, Minn. Property is in the Black Hills of South Dakota. Presumably idle.

PYTHON GROUP.**BRITISH COLUMBIA.**

Sundry claims near Kamloops, B. C.

Q. S. GOLD MINING & SMELTING CO.**WASHINGTON.**

Office: Spokane, Wash. Mine office: Conconully, Okanogan Co., Wash. Organized 1897, under laws of Washington, with capitalization \$2,000,000, shares \$1 par. Stephen E. Barron, president and general manager; A. M. Dewey, vice-president; Fred S. Kom, secretary; Fred S. Merrill, treasurer. Lands, 18 claims, also sundry millsites, area circa 400 acres, in the Salmon district, showing 3 ore bodies, of which one, undergoing development, is a mineralized dike of about 150' width, traceable 4,500' on surface, giving estimated average values of 2% to 10% copper, and \$3 to \$10 gold per ton.

ore being auriferous chalcopyrite. Development is by open-cuts, shafts and tunnels, with about 1,500' of openings. Principal opening is a 900' working tunnel, which will crosscut the dike at a further distance of about 300', giving a 600' back. Management seems honest and business-like.

QUARTETTE MINING CO.

NEVADA.

Office: 19 Milk St., Boston, Mass. Mine office: Searchlight, Lincoln Co., Nev. F. J. Harrington, superintendent. Mine is primarily of gold, with silver and copper as by-products. Has steam and gasoline power, 35-stamp mill and 100-ton cyanide plant, employing about 75 men.

QUEBEC COPPER CO., LTD.

BRITISH COLUMBIA.

Letter returned unclaimed from former mine office, Deadwood B. C.

LA QUEBRADA GROUP.

VENEZUELA.

Includes the principal mines of the Quebrada or Aroa district of Venezuela, which have produced about 60,000 tons of fine copper. Group includes the Cumuragua mine, having a vein of carbonate ore 1' to 5' wide; the Titiaira mine with vein 2' to 25' wide; the San Antonio mine, with vein of 3' to 18', and the Quebrada mine, with a vein 50' to 75' wide, 2,000' long and of unknown depth, from which oxide and carbonate ores have been mined in the alteration zone, leaving a large body of sulphide ore, averaging perhaps 5% to 6% copper, in the lower workings. This group is one of great importance, but owing to the extremely unsettled political conditions of Venezuela, capital cannot be induced to consider the reopening of the mines.

QUEEN BEE COPPER MINING CO.

Letter returned unclaimed from former office, 220 Broadway, New York.

QUEEN BEE GROUP.

ARIZONA.

Mine office: Kingman, Mohave Co., Ariz. Lands include the White Copper mine.

QUEEN BEE MINING CO.

AUSTRALIA.

Mine office: Cobar, Robinson Co., N. S. W. Australia. Is developing claims in the Bee Mountains, 11 miles southeast of Cobar, said to show a 50' vein giving assays up to 45% copper, with fair gold and silver values.

QUEEN OF ARIZONA COPPER CO.

ARIZONA.

Merged, 1902, in Great Belcher-Bullwhacker Gold Mining Co.

QUEEN OF BRONZE MINE.

OREGON.

Office: care of Wm. Tufts, Denver, Colo. Mine office: Takilma, Josephine Co., Ore. J. P. Murphy, superintendent. Ores are auriferous sulphides, assaying 12% to 60% copper. Has steam power.

QUEEN MINING & MILLING CO.

NEW MEXICO.

Office: care of H. A. Griffin, secretary, Galveston, Texas. Mine office: Cooney, Socorro Co., N. M. Organized under laws of Texas. Lands, 5 claims, known as the Copper Queen group, showing good bodies of low-grade gold-silver-copper ores, developed by about 3,000' of underground openings. Has steam power and 15-stamp pan-amalgamation mill.

QUEEN VICTORIA MINE.

BRITISH COLUMBIA.

Letter returned unclaimed from former mine office, Beasley, B. C.

Has a big bluff of copper ore, claimed to be 300' wide and 400' long, with rhyolite walls. Idle at last accounts.

QUEEN OF THE WEST MINING CO.

COLORADO.

Mine office: Central City, Gilpin Co., Colo. L. C. Moe, superintendent. Ores carry gold, silver and copper. Has steam power.

QUEENSLAND COOPER CO., LTD.

AUSTRALIA.

Offices: 6, Princes St., London, E. C., Eng. Mine office: Mt. Perry, Queensland, Australia. Employs about 300 men. Organized Feb. 1, 1898, with capitalization £500,000, shares £1 par, half in 6% cumulative preference and half in ordinary shares; issued, £213,507. Geo. Grinnell-Milne chairman; Laurence Pitblado, mine manager; J. S. MacArthur, consulting engineer; J. G. Tait, secretary. Lands, include the Mt. Perry and Reed's Creek mines, area 650 acres, freehold, also the Great Freehold mine, area 811 acres, all in the vicinity of Mt. Perry, Herberton district, Queensland. The Great Freehold has a nearly vertical fissure vein in granite, averaging about 5' wide and having an 18" paystreak carrying chalcopryite averaging about 14% copper, with fair gold and silver values, opened by a 200' main shaft. The Mt. Perry and Reed's Creek mines have similar fissure veins in granite, the main vein being about 12' wide, with pay-streak averaging 7" to 8" width on the upper levels and 10" on the lower levels, giving returns of about 16% copper. These mines have 15 shafts, of 120' to 800' depth, with ore reserves of about 9,000 tons. The company also works the Greenback, Potosi and Wolca mines, in the Wolca district, and the Boolboonda and Edena mines, carrying auriferous and argentiferous copper ores, in the Boolboonda district. The veins of nearly all of these properties are narrow, but also are rich and persistent.

The smelter, built at Mt. Perry, in 1902, has one 40-ton and one 90-ton water-jacket blast furnace, and it is planned to install a converter plant. The smelter is connected with the principal mines by a tram-line, and also does custom smelting. The management seems inclined to blame Mr. Allan Gibb, the former mine manager, for alleged shortcomings, but those who are best acquainted with Mr. Gibb will not feel inclined to give undue credence to the somewhat vague allegations regarding his alleged overstatement of reserves, and the other mistakes charged to his door. Sometimes, in mine finance, a scapegoat is required.

QUEENSLAND MINES EXPLORATION CO.

AUSTRALIA.

Dead.

QUEENSLAND PIONEERS, LTD.

AUSTRALIA.

Liquidated voluntarily.

QUEENSLAND SMELTING CO., LTD.

AUSTRALIA.

Offices: Dashwood House, London, E. C., England. Works office: Aldershot, Maryborough, Queensland, Australia. Chas. Poston, chairman; Arthur Kift, secretary and managing director. Organized Jan. 3, 1899, as a reconstruction of company of same name organized 1888, with capitalization £50,000, in £30,000 cumulative 5% preference shares and £20,000 ordinary shares; issued, £38,630. Debentures, £65,000 authorized, £37,800 issued, in £100 bonds at 5%. Property is 1,168 acres, freehold, with smelting

plant having furnaces for reduction of copper, gold, silver and lead ores. Paid a 5% dividend on preferred shares in 1903.

QUICKSILVER MINES, (CALIFORNIA, CALIFORNIA & OREGON. U. S. A.) LTD.

Offices: Broad Street House, London, E. C., Eng. W. Allaway, chairman; W. Harvie, secretary. Capitalization, £150,000. In addition to cinnabar claims, company owns 10 copper claims, area 200 acres, in Del Norte county, California, and Curry county, Oregon.

COMPANIA EXPLOTADORA DE LA MINA DE COBRE QUILLILA. MEXICO.

Office: Scranton, Pa. Mine office: Ameca, Jalisco, Mex. Employs 50 to 60 men. Chas. S. Weston, president; John W. Fowler, secretary and treasurer; Independence Grove, general manager; Felix Orozco, superintendent. Lands, 50 pertenencias, area 123 acres, in the Ameca district of Guachinango, showing 2 fissure veins in porphyry, of which one, averaging 4' to 6' width, is opened by 5 shafts, of 40' to 190' depth, and by 5 tunnels, longest 460', with about 1,500' of underground openings. Ores give average assays of about 9% copper, 10 oz. to 25 oz. silver and \$3 gold per ton.

QUINCY & ARIZONA DEVELOPMENT CO. ARIZONA.

Office: care of N. A. Metz, secretary and treasurer, Hancock, Mich. Mine office: Bisbee, Cochise Co., Ariz. J. J. Beatty, president; Geo. Keller, superintendent. Capitalization \$600,000, shares \$10 par. Lands, 12 claims, adjoining the Portage Lake & Bisbee. Idle.

QUINCY MINING CO. MICHIGAN.

Office: 45 Broadway, New York. Mine office: Hancock, Houghton Co., Mich. Employs 1,605 men. Incorporated 1848, under special Michigan charter; reincorporated March 6, 1878, for 30-year term, under general mining laws of Michigan. Capitalization \$2,500,000, shares \$25 par. Wm. R. Todd, president; Walter P. Bliss, vice-president; Don. M. Dickinson, general counsel; preceding officers, Chas. J. Devereux, Cleveland H. Dodge, Issac H. Meserve, and Danl. T. Brigham, directors; W. A. O. Paul, secretary and treasurer; John L. Harris, superintendent; Jas. W. Shields, mill superintendent; Thos. Whittle, mining captain; Chas. K. Hitchcock, Jr., engineer; Will P. Smith, smelter superintendent; Wm. Bath, smelter clerk; John Funkey, master mechanic; Old Colony Trust Co., of Boston, transfer agent. Dividends for 1904 were \$5.00 per share, giving total dividend disbursements of \$14,970,000. First dividend was paid 1862, and profits have been divided among shareholders regularly each succeeding twelvemonth, with the exception of the years 1866 and 1867.

(Official returns to the state of Michigan, as of date Jan. 1, 1904, disclose the following figures:

Amount cash paid in on capital stock	\$2,500,000.00
Amount paid in by conveyance of property to company..	1,000,000.00
Entire amount invested in real estate	2,500,000.00
Amount of personal estate	896,333.37
Amount of unsecured or floating debt.....	241,195.33
Amount due corporation.....	214,147.96

The following table shows statistics of production, costs, etc., since 1864:

Year.	Product. Pounds.	Yield fine copper per fathom broken. Pounds.	Price obtained. Cents.	Cost per pound exclu- sive of con- struction. Cents.	Number of miners.	Average monthly contract wages.
1864.....	2,498,574	562	44.8	26.7	242	\$65.50
1865.....	2,720,980	501	....	....	212	57.53
1866.....	2,114,220	451	31.3	29.0	227	53.16
1867.....	1,921,620	526	22.7	18.9	167	50.83
1868.....	1,417,941	447	25.2	23.1	157	50.43
1869.....	2,417,365	446	21.9	16.7	210	51.10
1870.....	2,496,774	528	21.5	15.3	181	46.09
1871.....	2,409,501	441	22.8	15.2	104	47.08
1872.....	2,269,104	391	32.5	22.9	233	60.62
1873.....	2,621,087	491	26.5	18.6	223	62.40
1874.....	3,050,154	577	21.9	15.1	234	43.38
1875.....	2,798,281	485	22.7	15.8	217	46.74
1876.....	3,073,171	507	20.0	15.7	227	47.13
1877.....	2,837,014	467	18.6	15.1	247	43.79
1878.....	2,991,050	395	14.9	14.0	234	41.50
1879.....	2,639,958	403	16.3	13.7	212	38.76
1880.....	3,609,250	563	18.5	11.8	192	49.10
1881.....	5,702,606	766	18.7	10.6	212	48.54
1882.....	5,682,663	800	17.1	9.5	152	48.83
1883.....	6,012,239	850	13.7	8.9	165	46.02
1884.....	5,680,087	722	12.2	8.6	157	43.35
1885.....	5,848,497	710	11.4	7.5	132	44.00
1886.....	5,888,517	638	11.1	6.8	140	45.80
1887.....	5,603,691	781	11.7	8.6	142	48.40
1888.....	6,367,809	690	15.9	10.1	158	49.60
1889.....	6,405,686	690	12.0	9.4	145	49.15
1890.....	8,064,253	769	15.7	8.2	146	52.60
1891.....	10,542,519	685	12.8	9.1	182	53.40
1892.....	11,103,926	572	11.2	8.8	238	53.75
1893.....	14,398,477	574	10.4	7.1	259	49.60
1894.....	15,484,014	584	9.5	5.7	285	50.70
1895.....	16,304,721	517	10.1	5.9	336	50.00
1896.....	16,863,477	477	10.9	6.5	379	52.00
1897.....	16,924,618	481	11.1	6.8	393	52.52
1898.....	16,354,061	513	12.0	6.8	381	52.50
1899.....	14,301,182	427	17.0	8.1	401	56.72
1900.....	14,116,551	391	16.6	9.3	433	62.00
1901.....	20,540,720	409	16.1	8.8	533	62.00
1902.....	18,988,491	347	11.9	9.0	562	62.00
1903.....	18,498,288	325	13.2	9.7	586	62.00
1904.....	18,343,160	307	13.3	9.7	592	62.40

The following table compares figures of production, income, costs and dividends for the years 1901 to 1904;

	1901.	1902.	1903.	1904.
Mineral, pounds.....	27,778,268	26,425,620	25,220,220	27,171,238
Copper, pounds.....	20,540,720	18,998,491	18,498,288	18,343,160
Gross receipts	\$3,327,071	\$2,275,819	\$2,447,351	\$2,472,379.27
Expenditures at mine	1,601,535	1,477,813	1,573,863	1,594,711.74
Construction account.	167,192	96,124	117,775	106,002.01
Smelting and misc ..	206,303	234,978	234,590	194,111.61
Net mining profit ...	1,352,039	466,904	521,122	655,926.68
Other income	72,503	31,096	17,804	27,630.02
Total net profit.....	1,424,542	498,000	538,926	577,554.91
Dividends	900,000	700,000	550,000	500,000.00
Balances	+524,542	-202,000	-11,074	+77,554.91

The deficits shown in the preceding table are the differences between net earnings and dividend payments, and came from the surplus.

The mine is opened on the Pewabic amygdaloid, which has an average dip of 52° to 54° at surface, and dip of approximately 37° 30' at a depth of 5,000' in the lowest workings, the shafts following the pitch of the lode on catenary curves. The average width of the lode is about 20' in the upper workings, but is materially narrower at the bottom, and copper values also are less, the rock showing very little heavy copper in the lower stopes, but being more uniform in values than above, where it was decidedly bunchy. The lode has an extreme width of 40' at several points and is only 10' to 15' wide in No. 8, the northernmost shaft. About one-third of the production was heavy copper some years ago, but this has decreased to less than 15% of the total mineral, though probably nearly 20% of the total refined copper. In the upper levels immense masses of native copper were found frequently, these ranging up to 300 tons in weight. The southernmost drifts in the Quincy are under the village of Hancock and nearly 3,000' below the mean water-level of Portage Lake, while the northernmost workings, in the Mesnard shaft, are about 8,000' from the breasts of the southern drifts, with about a mile of the lode untouched on the Mesnard and Pontiac tracts north of No. 8 shaft. The walls are strong and little timbering is required, dry walls being built of waste rock in wide stopes, thus saving the cost of hoisting worthless rock and the expense of extra timbering. Fire-doors have been installed and every precaution is taken against fire. Miners are carried to and from their work in man-cars holding 30 men. All hoisting cables are inspected frequently and every care taken to prevent accidents. Shafts are sunk mainly in the foot-wall, obviating the necessity of leaving large quantities of lode-rock unmined for pillars.

The Quincy has several cupriferous amygdaloids in addition to the Pewabic, and was opened originally, in 1848, on the Quincy amygdaloid, a parallel bed lying some distance west of the Pewabic, which was abandoned when the Pewabic lode was opened, in 1856. There also is a foot-wall branch, known as the Pewabic East Lode, underlying and paralleling the main bed,

which yields good returns occasionally. The so-called West lode, 300' west of the Pewabic, has been opened by crosscuts from the 36th, 39th, 40th, 44th, and 49th levels, showing fairly well on the 39th and 40th levels, but poorly elsewhere. A little work was done on this lode in 1903 on the 39th level, north of No. 7 shaft, and several small bunches of good ground were opened and stoped, but not enough to pay for working. About 150' west of the West lode is another amygdaloid, averaging 40' width and carrying more or less copper, which possibly may prove workable. About 1,000' west of the Pewabic is the Hancock amygdaloid, which was narrow but fairly mineralized, where worked in the old Hancock mine.

Owing to the absorption of the Pewabic and Mesnard mines, shafts are numbered irregularly. The southernmost is No. 7, 5,162' deep to the 59th level; 860' next north is No. 4 which is 4,186' deep to the 51st level; 585' next north is No. 2, which is 5,289' deep to the 61st level, being more than one mile in depth, and the deepest in the Lake Superior district outside of the Calumet & Hecla and Tamarack mines; 1,928' next north is No. 6, which is 5,255' deep to the 60th level, and 4,168' north is No. 8, the Mesnard shaft, 2,909' deep to the 22d level. Extreme distance is 7,541' between No. 7 and No. 8 shafts, the Franklin mine intervening between shafts 6 and 8.

No. 7 shaft, planned and sunk by Mr. Harris, is on a catenary curve, leaving surface at an angle of 53° but bottomed at about 37° 30'. The shaft was sunk 4,000' in 18 months, through exceedingly refractory rock, this speed being made possible by sinking and raising in 5 sections simultaneously. The steel shaft-rockhouse is 100' high, with large wings, fitted with steam-hammer and 5 Hodge crushers. The hoist is an Allis-Chalmers Corliss type direct-acting engine of 8,000 h. p., with cylinders 52x84" and winding drums 28' in diameter by 11'9" face, carrying 8,000' of 1½" steel cable, capable of raising 6-ton skips from a depth of 1½ miles at a speed of 3,000' per minute, hoisting being limited to this rate by an automatic cut-off, which also prevents overwinding. Starting a load of 6 tons from a depth of nearly one mile, the hoist, if untouched, will check, after raising the skip a few feet higher than the appointed place in the shafthouse, without damage of any sort. The main shaft carrying the drum weighs 60 tons. This hoist was given a new and greatly strengthened foundation in 1904. The engine house is 58x94', with 56x92' boiler house adjoining, both of stone with steel truss roofs. This shaft produces about 1,000 tons daily, or approximately 30% of the total output of the mine.

The stoping ground tributary to No. 4 shaft is nearly exhausted, and as a new hoist would be required for greater depth, and the lower stretches of ground tributary to No. 4 can be reached easily from No. 7 by electric trams, No. 4 will be abandoned. The water heretofore forked from No. 4 is to be raised through shafts Nos. 2, 6 and 7, these having 1,300-gallon bailers for the purpose.

Equipment at No. 2 shaft is practically a duplicate of that at No. 7.

No. 6 shaft, only 200' south of the Franklin line, has an Allis-Chalmers hoist with a drum 22'6" in diameter, raising 8-ton skips.

No. 8 shaft, on the Mesnard tract, is showing decided improvement in value at depth. No. 8 has a 12-drill Rand air-compressor with 17x24" cylinders, the boilers, hoist and compressor being housed in a single frame building. The shafthouse is similar to those at Nos. 2 and 6 in design and equipment. Stopping is in progress on the 10th, 15th, 18th, 20th and 22d levels. The lode shows improvement at depth and is better toward the Franklin boundary, in the south drifts, than to the northward. Connection should be established with No. 6, by a drift run completely under the Franklin mine, on about the 45th level, during 1905. The hoist, taken from No. 2 shaft, is good for 4,000' depth, and will be replaced by a hoist of about the same capacity as that at No. 6.

Electric underground traction is in extensive use throughout the mine. The plant was installed by the General Electric Co., tram-lines averaging about 1,800' each in length, with gradients of 1.5% towards the shafts. The equipment includes 15 electric locomotives, each weighing 5,500 lbs., standing 3' high by 43" wide and 9' long, with draw-bar pull of 700 lbs. on a level track, each hauling 4 or 5 three-ton rock cars at a speed of 6 to 8 miles per hour, one man caring for each train. The underground traction power plant is on the 57th level of No. 2 shaft, having a 100-kw. direct current generator operating the haulage system. Tram-cars are unloaded into 500-ton storage bins, built on the hanging-wall side of the shafts, there being such bins on two levels of No. 2 shaft, 4 levels of No. 6 shaft and 7 levels of No. 7 shaft. This system of storage obviates the loss of time by either the tram-lines or skips, and adds at least 25% to the hoisting capacity of the mine. Eventually power traction will be extended to No. 8 shaft, when connected with the older workings.

The mine employs 180 power drills in drifting and stopping, and the diamond drill is used extensively in exploratory work. The mine is troubled by air-blasts, these being violent disturbances of a nature not thoroughly understood, but presumably caused by the settling of superincumbent rock in the scores of miles of worked-out openings, causing violent compression of the air elsewhere throughout the mine and giving considerable trouble, and occasional loss of life. The great depth of the mine renders it difficult to retain the best class of labor, especially when newer and shallower mines but a few miles distant are seeking men.

The surface plant is exceptionally complete. The 62x145' machine shop, of stone, brick and steel, with truss roof, is absolutely fire-proof, and has a traveling crane covering the entire shop, with a complete equipment of modern machinery and tools. Adjoining is a 53x69' compressor-house, of stone and steel, with fire-proof truss roof, housing two 60'-drill cross-compound two-stage condensing right and left hand Corliss air-compressors, so connected that air from them is available in any part of the mine, the cross connection eliminating danger of inadequate air supply through disabling of either section. Steam from the compressor plant exhausts into a dam built for the purpose. A plastered brick tunnel connecting boiler-house, machine shop and compressor plant, serves as a conduit for steam and air

pipes. The blacksmith shop is 50x154', with a 50x90' wing, of ashlar-finished redstone, with fire-proof steel truss roof having 3 large ventilators, and is equipped with 12 forges, steam-hammers, fan, bolt-cutters, drills, grindstone, etc., being a model smithy in every respect. Near No. 7 shaft are two boiler-houses, each having eight 100-h. p. Roberts tubular return horizontal boilers. A 56x75' boiler-house at No. 6 shaft has four 250-h. p. Wickes water-tube vertical boilers and nine 100-h. p. horizontal locomotive firebox boilers, also a powerful fire pump. The water for boilers and mine location is taken from Portage Lake, the pumping station, on the margin of the lake, being of ashlar-finished redstone, the pumps forcing water for one mile against a head of 640'. The coal yard is between shafts 2 and 4. Steam engines have been replaced by electric motors in the carpenter shop, roundhouse and smithy. The mine has a private telephone system with 25 instruments connecting the principal mine and mill buildings, and a 20x25' frame exchange building. The company owns several hundred dwellings, the newer structures being mostly of 7-room size, on solid stone foundations, the mine location being noted for its neatness. The company also has extensive holdings of valuable land adjoining the city of Hancock, and portions of this ground are platted from time to time, for residence purposes, and sold at good prices.

The Quincy & Torch Lake railroad, 6 miles long, built by the company in 1890, touches all of the shafts and buildings at the mine, and at the boiler house, wharves and coal-shed at the mill, and is connected with the Mineral Range, Hancock & Calumet and Copper Range railroads. The Quincy & Torch Lake has solid rock ballasting and steel bridges, with a continuous downgrade haul between the mine and the mill. Equipment includes 6 locomotives, freight cars and nearly 150 hopper-cars for rock. All of the newer cars have automatic couplers and air-brakes. The roundhouse is near No. 7 shaft and has a 36x40' addition containing a special machine shop for the use of the railroad.

The mills are at Mason, on Torch Lake. No. 1 mill, of wood, has 5 Allis-Chalmers 2-way stamps with 20" cylinders, using the coarse stamping system. Dressing machinery includes 92 Hodge jigs and 30 Wilfey tables, and 40 extra roughing jigs and 30 finishing jigs were added in 1903, and 8 more roughing jigs and 6 finisher jigs were added in 1904, the latter treating material in combination with Wilfey tables. No. 2, standing 630' north of the old mill, is 132x216' in size, of steel on stone foundations, with 180 windows, each having 13½ sq. ft. of glass, flooding the interior with light. This mill has three 20" Allis-Chalmers heads, each stamp set on foundations of heavy timbers and concrete, surmounted by a bottom plate of 22 tons, a middle plate of 18 tons and a top plate of 18 tons, all of solid iron castings, above which are the mortar-boxes of the stamps. Finisher jigs and slime-tables have been replaced by 24 Wilfey tables, 8 for each stamp, assisted by 4 Standard concentrators. Each stamp has 12 rough jigs, 6 Wilfleys for finishing and 2 Wilfleys and 1 Standard table for slimes. Stamps have 1" revolving screens for mortar-boxes and the mill has a settler, from which slimes are taken to the Wilfey tables. Regrinding is done by a Trent

Chilean grinder with 3 jigs and 3 Wilfleys as auxiliaries. Regrinding of raggings in No. 1 is done by an Allis-Chalmers Huntington mill. The mortars of all stamps have hydraulic discharges, which give about 60% of the total production of copper secured at the mills. The power plant at No. 2 mill is 56x90', of steel on stone foundations, housing four 250-h. p. Wickes vertical water-tube boilers, and having a 100' smokestack surmounting a 30' foundation. Both mills have trolley systems for handling mineral, and a short railway, with electric locomotive hauling 4-ton mineral cars, connects the two mills. A 54' platform Howe mineral scale has 110 tons capacity. The heads in the two mills averaged 570 tons daily in July, 1904, or an increase of about 25% in two years, giving a gross stamping capacity of about 4,000 tons daily, allowing for time lost in changes and repairs.

The 54x54' brick and steel pumphouse at the mill has a 20,000,000-gallon Allis-Chalmers vertical triple-expansion pump, and the old pumphouse has 3 pumps with a combined capacity of 21,000,000 gallons daily. Water is taken from a 7x7' 6" tunnel, driven 100' under the bed of the lake. A 6x6' 6" tunnel 440' long connects the mills, boiler-houses and pump-houses, this being bricked and plastered inside and carrying both water and steam pipes. The mill has an electric light plant, machine shop and sundry minor buildings, and a considerable village has grown up about the works.

The Quincy has three docks. One is at Hancock, with a 40x416' wharf and 64x124' warehouse, with deep water in front and railroad tracks behind. A second dock, at the Ripley smelter, has a 350' shipping wharf for copper and a 250' coal wharf. The third dock, at the Torch Lake mills, has a 40x400' wharf, built of Washington fir, with 18' of water alongside, on it standing a 300x300' coal-shed of steel with corrugated iron siding and roofing, having storage capacity for 80,000 tons of bituminous coal, this being about the annual consumption of the mine and mills. There are three coal-hoists, with 120' steel towers traveling on a track 22' wide and 300' long that runs the entire length of the shed. The coal-hoists are operated by steam power and can unload 100 tons each per hour. The plant was built by the American Bridge Co., at a cost of about \$200,000, and effects a saving of about 12 cents per ton on all coal used by the company. The railroad reaches the shed by a 650' trestle, partly of timber and partly with steel bents, supported on 240 concrete piers.

The Quincy smelter, blown in Dec. 1, 1898, is at Ripley, opposite Houghton, principal buildings being of ashlar-finished redstone. The 84x144' main building has four 40-ton reverberatory furnaces with 75' stacks, and a new reverberatory building has a furnace, blown in September, 1904, of about 50% greater capacity than the old reverberatories. The new furnace casts in automatic moulds. Other structures are the cupola building, engine-house, casting-house, coal-shed, cooper shop and a 50x100' frame warehouse. The smelter is estimated to save the Quincy about \$100,000 yearly. A trolley dipping system and a trolley system for handling large bars and cakes are in use, and mineral is transported from mills to the smelter in hopper-cars, instead of in barrels as formerly. A new mineral warehouse,

40x95', of redstone, was built 1904. Cars enter over a 460' trestle and dump into large bins with hopper bottoms, whence mineral is drawn off as required. Mineral is brought to the warehouse in steel cars, instead of in barrels, as formerly, and remains for 24 hours at an average temperature of 80° F., thereby evaporating considerable moisture. In addition to its own work the Quincy smelter also treats the mineral of the Franklin mines.

The production of refined copper has remained about stationary for several years, but constantly increasing rock production is required to maintain the output of fine copper. The preceding table gives full details regarding the falling off in values. Barring accidents, 1905 should show a small increase in fine copper produced.

But for the heavy outlay for improvements begun in 1898, the Quincy could not operate at a profit on 12-cent copper. The wisdom of the heavy expenditures then made was questioned, rather querulously, by many shareholders, but it was vital to the mine's future. The mine is being very carefully managed, but its officers have no sinecures. There are many and serious problems arising from year to year, each demanding prompt solution. That the Quincy has been able to maintain production and continue heavy dividend payments under the many disadvantages from which it has suffered, is ample evidence of the ability with which the property is being handled.

QUINCY MINING CO.

UTAH.

Property sold, 1902, to Daly West Mining Co.

QUINTERA MINING CO., LTD.

MEXICO.

Offices: 18, Bishopsgate St., London, E. C., Eng., and 2, Square de l'Opera, Paris, France. Mine office: Alamos, Sonora, Mex. J. Kulp, chairman; J. G. Mills, secretary; E. Renaud, manager. Capitalization, £52,000. Pays annual dividends of 2s. to 5s. It is primarily a silver mine, making lead and copper as by-products. Main shaft is 1,100'. Has steam and electric power, 20-stamp mill, 20-ton leaching plant, 25-ton concentrator and 35-ton smelter, employing several hundred men. Production for 1903 was 18,000 kgs. of refined copper.

RADLEY & SHAW CLAIMS.

BRITISH COLUMBIA.

Lands, 7 patented claims, area 268 acres, at Brown's Bay, Discovery Passage, Vancouver Island, B. C., with 4 ore bodies, opened by tunnels of 35', 122' and 256', showing bornite giving average assays of 8% copper, 2 oz. silver and \$3 gold per ton. Presumably idle.

RAMBLER COPPER MINING CO.

ARIZONA.

Office: 110 South Broadway, Los Angeles, Cal. Mine office: Stoddard, Yavapai Co., Ariz. Henry Reifsneider, superintendent. Capitalization \$500,000, shares \$1 par. Lands, 7 claims, area 140 acres, showing ores giving assays of 12% to 42% copper. Has gasoline power.

RAMBLER COPPER MINING CO.

WYOMING.

Property transferred, Oct. 1, 1902, to Rambler Mining & Smelting Co.

RAMBLER MINING CO.

WYOMING.

Office and mine: Rambler, Carbon Co., Wyo. Idle. S. H. Potter, president; Aaron Slothower, treasurer and general manager; L. S. Niece,

secretary. Organized under laws of Wyoming, with capitalization \$2,000,000, shares \$1 par. Lands, 9 claims, area 160 acres, in the Battle Lake district, showing veins occurring as fissures in diabase schists and as contacts between diabase and quartzite, veins ranging 1' to 6' in width, and giving assays up to 25% copper and \$1 to \$10 gold per ton, from oxide, carbonate and sulphide ores. Development is by a 100' main shaft and a 550' crosscut tunnel. Idle at last accounts.

RAMBLER MINING & SMELTING CO.

WYOMING.

Office: Laramie, Wyo. Mine office: Holmes, Albany Co., Wyo. Organized October, 1902, under laws of Wyoming, with capitalization \$2,000,000, shares \$1 par. Frank M. Wooton, president; Avery T. Holmes, vice-president; Milton M. Green, secretary. Property is leased to the North American Exploration Co. Lands, 10 claims, area 200 acres, at head of Douglass Creek in the Medicine Bow Range, 9,500' above sea-level and well timbered with spruce and pine.

Mine was opened for gold in 1870 and relocated for copper in 1900. Country rock is dioritic granite, no sedimentary beds being found in the neighborhood, and ore body apparently is a fault-fissure, in granite. Mine is opened by a 65' vertical shaft, from bottom of which an incline runs on the vein at an angle of 45°, with three levels opened. The vertical main working shaft, 175' deep, is connected with the original workings on the second level at 95' and at the third level at 128'. There are shaft-houses at both shafts, the working shaft having a cage and 35-h. p. friction hoist. The mine has about 1,000' of underground openings, and is claimed to have 22,100 tons of ore, ranging from 20% to 45% copper, blocked out for stoping, on the first and second levels. Exact size of the ore body is undetermined, but ore gives assays ranging from 6% to 39% copper, with average returns of about 33% copper from carefully hand-selected ore shipped in 1902. Ore has a gangue of decomposed granite, giving talcose alteration products and carrying more or less pyrite, hematite and marcasite, all useful fluxes and all carrying small percentages of copper. The gangue is easily separable, if concentration should be desired on the low-grade ores.

The Rambler carries a great variety of copper minerals, in various stages of alteration and associated with sundry rare metals in commercial quantities, but comparatively free from such deleterious elements as antimony, bismuth and arsenic. The vein carries a little native copper, associated with cuprite, in the upper levels, and also gives melaconite, chrysocolla, chalcocite, covellite and chalcopyrite, and is especially notable for containing large quantities of covellite carrying gold, iridium, osmium, palladium and platinum, the latter occurring as sperrylite, the only known occurrences of platinum with copper being in Wyoming. Assays of Rambler matte have given returns as follows, per ton of blister copper: 6.75 oz. silver, 2.25 oz. gold and platinum, and 6 oz. palladium. The value of the palladium is contingent upon finding a market for this rare metal at \$10 per ounce, in considerable quantities. Cost of refining the matte and separating the various rare metals is approximately \$40 per ton, or 2 cents per lb. of blister copper.

Surface improvements include a 21x44' shafthouse, ore bins connected with shafthouse and smelter by trestle, carpenter shop, smithy, office, assay office, sawmill, boarding house and bunk-houses, also a smelter, with 40-ton water-jacket blast-furnace, which makes matte, when in operation. Ores are self-fluxing. Production in 1903 was 249,196 lbs. fine copper.

RAMBLER EXTENSION MINE.

WYOMING.

Includes the Big Nell and sundry adjoining claims, in Albany county, Wyoming.

RAMMELSBURG MINE.

GERMANY.

Office and mines: care of Königliches Oberbergamt, Clausthal im Harz, Germany. Property is owned jointly by the Crown of Prussia and the Duchy of Brunswick. Employs about 650 men. Bergrat Richard, director. The ore occurs as a great lense, 40' to 50' in width and about 4,000' long, country rocks being schists intercalated in Devonian slates. Ores are chalcoppyrite and tetrahedrite, associated with galena, sphalerite and pyrite.

The mine is developed by shafts of 296 metres and 316 metres, and has about 15,000 metres of openings, estimated to show about 15,000,000 metric tons of cupriferous slates carrying an average of about 6% copper, 10% lead, 20% zinc and 3 oz. silver per ton. Mine has 2 hoists, good for 350 metres depth, and a 30-drill air compressor.

The smelter, at the mines, is of 300 tons daily capacity. Equipment includes 20 kilns and ovens for calcining, 12 blast furnaces, of 25 tons daily capacity each, and 5 reverberatory furnaces of 15 tons daily capacity each. Product is turned out as blister copper and anodes. The works also have an electrolytic refinery, and an acid plant, annual capacity of latter being 25,000 tons of sulphuric acid of 50° Beaumé. Annual production of the works is about 1,700 metric tons of refined copper, in various forms, and 1,100 tons of bluestone. Production in 1902 was 3,608,930 lbs. electrolytic copper; 1,074 metric tons blue vitrol; 96.5 kgs. refined gold, 11,522 kgs. refined silver; 5,239 metric tons lead, also minor by-products including copperas, zinc-vitriol, soda, etc. Production for 1904 was 1,584 metric tons refined copper.

MINA DE RAMOS.

MEXICO.

Office: care of D. E. Murphy, lessee, Aguascalientes, Mex. Mine office: Ramos, San Luis Potosi, Mex. Francis H. Sisterman, general manager. Is a producer of silver and copper. Main tunnel, 1,000'. Has steam and gasoline power and concentrator, employing about 250 men.

JOSÉ TOMÁS RAMOS.

CHILE.

Owns the Chalinga mine, in the department of Illapel, Chile. Idle.

RAMSDALL-PARROT MINE.

MONTANA.

At Butte, Silver Bow Co., Mont. Is connected on the 400' and 500' levels with the Colusa-Parrot mine.

RANKIN COPPER MINING CO.

WYOMING.

Office and mine: Rawlins, Carbon Co., Wyo. Organized 1904, with capitalization \$25,000.

RANSON COPPER MINING COMPANY OF ONTARIO, LTD. ONTARIO.

Office: Sault Ste Marie, Mich. Organized 1902, under laws of Ontario, with capitalization \$3,000,000, shares \$1 par. B. Frank, president; David Rustander, secretary; D. J. Ranson, superintendent; R. H. Taylor, consulting engineer; John C. Byrne, mining captain. Lands, 3,600 acres, in Chesley and Anderson twps., Algoma, Ontario, said to show 14 veins, of which 6 contact veins have been prospected, these averaging 25' width and giving assay values of 12% copper and 3 oz. silver per ton, from chalcopryrite. Has steam power and 8 shafts, of 23' to 75'. Idle.

RARITAN COPPER WORKS.**NEW JERSEY.**

Works office: Perth Amboy, N. J. Is owned and operated by the United Metals Selling Co. Plant, completed in 1899, is one of the largest and most modern in the world, doing an immense business in refining blister copper electrolytically for the subsidiary properties of the Amalgamated Copper Co., and for many independent mines in the United States, Canada and Mexico.

RARUS MINE.**MONTANA.**

At Butte, Silver Bow Co., Mont. Held by the United Copper Co., and is the subject of numerous lawsuits between the subsidiary corporations of the Amalgamated and United Copper companies. Employs several hundred men when fully worked, but is idle frequently, owing to litigation. Vein is upwards of 300' wide in places.

RAVEN MINING CO.**MONTANA.**

Mine office: Butte, Silver Bow Co., Mont. Organized 1903. Chas. E. Morris, president. Lands include the Raven mine and a four-sevenths interest in the Snoozer mine, with an option on two-sevenths of balance, located near the Mountain Consolidated. Main shaft is 625', showing ores carrying values in silver, gold and copper. It is planned to sink the shaft to depth of 1,000' during 1905.

RAWLEY MINING CO.**COLORADO.**

Mine office: Bonanza, Saguache Co., Colo. David G. Weems, manager. Ores carry lead, silver and copper. Has steam and electric power.

RAY COPPER MINES, LTD.**ARIZONA.**

Offices: 1, Gresham Bldgs., London, E. C., Eng. Mine office: Ray, Pinal Co., Ariz. Property in hands of a receiver since 1901, owing to bad management and litigation. Lands, 1,296 acres, on Mineral Creek, Pinal county. Mine is opened by shafts and tunnels and has steam and gasoline power, with a 250-ton concentrator and 6-mile narrow gauge railroad. Is estimated to have nearly 1,000,000 tons of 4.5% copper ore in sight. Property is valuable, and with reorganization or sale should make a good mine. Management said to contemplate resumption of work and sinking of main shaft to depth of 800'.

RAYNOR COPPER MINING CO.**CALIFORNIA.**

Office: 1003 Call Bldg., San Francisco, Cal. Mine office: Lewis, Mariposa Co., Cal. John N. Bourdette, president; H. V. Raynor, secretary; John C. Jens, manager. Has carbonate and sulphide ores of copper, opened

by shafts. Has gasoline power and is said to plan installation of a small smelter. Employs 10 to 15 men.

READY PAY MINING CO.**NEW MEXICO.**

Mine office: Hillsboro, Sierra Co., N. M. Ores carry gold, silver and copper. Presumably idle.

REALTY SYNDICATE.**CALIFORNIA.**

Offices: 101 Sansome St., San Francisco, Cal. Mine office: Mills College, Alameda Co., Cal. F. M. Smith, president and general manager. Property is the Leona Heights mine, in the outskirts of Oakland, showing cupriferous iron pyrites with heavy gossan capping, ore carrying 1% to 2% copper and being rich in sulphur.

REBECCA COPPER MINING CO.

Office: 542 The Rookery, Spokane, Wash.

REBECCA EXTENSION COPPER MINING CO.

Office: Spokane, Wash.

MINA LA RECOMPENSA.**MEXICO.**

Mine office: Santa Maria Dolores, Durango, Mex. P. J. Opperman, superintendent. Ores carry gold, copper and zinc. Has steam and water power, and a 10-stamp mill, employing about 60 men.

RED BIRD MINING CO.**MONTANA.**

Office: Helena, Mont. Mine office: Austin, Lewis & Clarke Co., Mont. Employs 32 men. Organized August 18, 1902, under laws of Montana, with capitalization \$1,500,000, shares \$5 par. Samuel J. Punches, president, treasurer and general manager; R. A. Punches, vice-president; J. M. Clements, secretary. Lands include the Red Bird mine, area 180 acres, in the Greenhorn district, showing country rocks of granite and limestone, carrying 15 fissure veins, of which 6 of 5' average width are being developed, these giving estimated average values of 21% copper, 45% lead, 35 oz. silver and \$5 gold per ton, from oxide and sulphide ores. Property also shows a 42% iron ore body. Mine is developed by shafts of 200', 350', 400' and 600', with about 2,000' of underground openings. Company also has taken a bond and lease on a property adjoining the Red Bird, on which a 160' vertical shaft shows a 10' vein carrying 7% copper ore. Has steam power and ships ore to the Helena smelter, a spur from the Northern Pacific railroad permitting loading of ore direct from mine into cars.

In 1904 the company acquired the Copper Hill and Reliance groups. The Copper Hill, near Austin, has a 150' shaft, showing a 30' vein, and is being fitted with a new mining plant. The Reliance group, in High Ore Gulch, Cataract district, Jefferson county, is a producer and is being given new machinery.

The company paid monthly dividends of \$3,000 during 1903 and 1904, and has paid \$78,000 to end of 1904. The Red Bird is an excellent example of a small, well managed and profitable mine.

RED CLOUD MINE.**MONTANA.**

Office and mine: Garnet, Granite Co., Mont. Dr. Peter Mussigbrod, superintendent. Ores carry gold, silver, copper and lead. Has a 10-stamp mill and steam power, employing about 40 men.

RED CLOUD MINING CO.**CALIFORNIA.**

Office: Los Angeles, Cal. Mine office: Salton, Riverside Co., Cal. E. H. Gould, superintendent. Ores carry gold, silver, copper and lead. Has steam and gasoline power, 2-stamp mill, concentrator and 80-ton smelter, employing about 50 men at last accounts.

RED FOX MINING CO.**BRITISH COLUMBIA.**

Mine office: McGuigan, Yale & Cariboo district, B. C. Has cupriferous silver-lead ores.

RED JACKET & BISBEE DEVELOPMENT CO.**ARIZONA.**

Out of business. Fully described in Vol. IV.

RED ROCK COPPER CO.**ARIZONA.**

Mine office: Tucson, Pima, Co., Ariz. J. C. Perry, agent. Idle.

RED STAR MINING CO.**WASHINGTON.**

Mine office: Kalama, Cowlitz Co., Wash. Ores carry gold, cinnabar and copper. Apparently idle.

RED WING MINING & MILLING CO.**UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. E. W. McGarrick, superintendent. Has auriferous and cupriferous silver-lead ores.

RED WING EXTENSION MINING CO.**UTAH.**

Office: care of E. W. McGarrick, president, Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. Capitalization \$125,000, shares 25c. par. Lands, 120 acres, adjoining the Red Wing mine, showing a 4' vein giving average assays of about 0.5% copper, 7% lead and 8.5 oz. silver per ton, with about 60,000 tons of ore said to be in sight.

REDDING GOLD & COPPER MINING CO.**CALIFORNIA.**

Office: 222 California Safe Deposit Bldg., San Francisco, Cal. Mine office: Redding, Shasta Co., Cal. Organized under laws of South Dakota, with capitalization \$1,000,000. Has authorized a bond issue, amount not learned, at 6% Calvin S. Mitchell, president; Thomas M. Gilbert, vice-president; Thomas Gilbert, secretary; A. A. Watkins, superintendent. Lands, about 30 claims, including the Bedford group, north of Keswick, the Stabler group, north of Centerville, and the Sky Blue group, at the mouth of Middle Creek. Has steam power.

REDEMPTION MINE.**ARIZONA.**

Office and mine: care of R. J. Ferguson & Sons, owners, Chloride, Mohave Co., Ariz. Ores are auriferous and argentiferous copper oxides.

REDWOOD COPPER QUEEN MINING CO.**CALIFORNIA.**

Office: San Francisco, Cal. W. P. Ferguson, president; Thos. Mellersh, secretary and treasurer. Lands, 840 acres, patented, 35 miles southeast of Ukiah, Mendocino county, California, developed by tunnels and winzes. Vein, much broken by faults prominent on surface, has a 2' to 4' gossan capping traceable for a mile. Country rocks are brecciated porphyry and sandstone. Ores include azurite, malachite, cuprite, melaconite, tetrahedrite and chalcopyrite.

REED GOLD & COPPER MINING CO.**VIRGINIA.**

Letter returned unclaimed from former office, Norfolk, Va.

REFORMA MINING CO.**MEXICO.**

Letter returned unclaimed from Fuerte, Sinoloa, Mexico.

COMPANIA MINERA LA REINA.**MEXICO.**

Mine office: Cusihiuriáchic, Chihuahua, Mex. Ramon Navarro, president and manager. Ores carry silver, lead, gold and copper. Has gasoline power and three Huntington mills, employing about 150 men.

MINA REINA DE CORBE.**MEXICO.**

Mine office: Alamos, Sonora, Mex. Alfredo R. Cano y Ca., owners: Juan G. Cano, manager. Ores carry gold, silver and copper.

COMPANIA MINERA REINA DE COBRE.**MEXICO.**

Mine office: Ejutla, Oaxaca, Mex. Capitalization \$100,000, Mexican. Jas. Butler, general manager; Juan de Peza, superintendent. Property is the Luna de Oaxaca mine.

REINDEER MINING CO.**IDAHO.**

Office and mine: care of A. M. Strobe, president and manager, Mullan, Shoshone Co., Idaho. Said to have a vein showing 2' of 20% copper smelting ore and 3' to 6' of concentrating ore.

REINS COPPER CO.**MONTANA.**

Office and mine: 46 East Broadway, Butte, Silver Bow Co., Mont. Employs about 25 men. Organized April 27, 1903, under laws of Montana, with capitalization \$1,500,000, shares \$1.50 par. John P. Reins, president; Thos. M. Hodgens, treasurer; W. W. McDowell, secretary; E. J. Trerise, area superintendent; G. L. Thompson, purchasing agent. Lands, one claim, 18 acres, in the Meaderville copper belt, just east of Butte. Mine, formerly known as Betsy Dahl, later as the Combination, was tied up by litigation from 1881 to 1902. Is opened by an 800' shaft with 800-gallon pumps on the 800' level. The east drift on the bottom level shows a 7' vein of copper-silver ore. Property carries the extension of the Leonard vein and adjoins the Minnie Healy mine. Equipment includes a 240-h. p. steam plant, 900' hoist and 5-drill air compressor. Property will begin shipping to the Washoe smelter in 1905. Management is good, and property, though small, is considered promising.

RELIANCE GOLD MINING CO.**ARIZONA.**

Mine office: Groom Creek, Yavapai Co., Ariz. L. A. Davies, superintendent. Has steam power and 10-stamp mill.

RELIANCE GOLD & COPPER MINING CO.**ARIZONA.**

Office: 15 Brown Palace Hotel, Denver, Colo. Mine office: Turkey Creek, Yavapai Co., Ariz. Capitalization \$1,500,000, shares \$1 par. C. S. McElrath, president; E. J. Price, vice-president; H. G. Trester, secretary; W. D. Webster, superintendent. Lands, 11 claims, area 220 acres, in two groups, in the Big Bug district, showing auriferous and argentiferous copper ore.

REPUBLIC CONSOLIDATED MINING & MILLING CO.**COLORADO.**

Mine office: Idaho Springs, Clear Creek Co., Colo. Thos. B. Crow, superintendent. Ores carry gold, silver, lead and copper. Has steam power and employed about 20 men at last accounts.

REPUBLIC SMELTING CO.**COLORADO.**

Office and mines: Leadville, Lake Co., Colo. Capitalization \$500,000. Property is the remodeled 500-ton smelter, with 3 furnaces, formerly owned by the Boston Gold-Copper Co.

RESCUE COPPER CO.**ARIZONA.**

Evidently reorganized as Shotwell Tri-Mountain Copper Co.

RESOLUTE COPPER CO.**MICHIGAN.**

Office: care of John F. Carey, president, Escanaba, Mich. Lands, 1,120 acres, in sections 7-18-19, 58-29, Keweenaw county, Michigan. Organized 1899, under laws of Michigan, with paid-up capital \$25,000, shares \$25 par. John D. Cuddihy, Calumet, Mich., vice-president; A. F. Heidkamp, Lake Linden, Mich., secretary; J. L. Nankervis, Calumet, Mich., treasurer. Main shaft, 379', with about 2,000' of drifts. Idle many years.

MINA RESTAURADORA.**ARGENTINA.**

Now owned by Capillitas Copper Co., Ltd.

MINA LA REVANCHA.**MEXICO.**

Mine office: Ojocaliente, Zacatecas, Mex. J. Incarnacion Spina, owner; R. Spina, manager. Ores carry silver, lead and copper. Has steam power and Chilean mill, employing about 50 men.

REVENUE MINING CO.**WASHINGTON.**

Office: 201 Northwestern Bldg., Minneapolis, Minn. Frank E. Plummer, president; Edwin Perry, vice-president; D. A. Simmons, secretary; Sterling Cross, treasurer. Organized 1901, under laws of Arizona, with capitalization \$1,250,000, shares \$1 par. Lands include the Revenue group of 140 acres, showing copper-gold ores, in Stevens county, Washington; oil lands in Utah; zinc and slate lands in Arkansas, and a gas franchise for the town of Belton, Missouri. Cannot be learned that any work is in progress.

REVENUE MINING & MILLING CO.**WYOMING.**

Office: care of F. D. Russel, Denver, Colo. Mine office: Encampment, Carbon Co., Wyo. Development is by two tunnels, cutting two veins giving good assay values in copper, and also carrying small quantities of gold, nickel and uranium.

REWARD MINE.**CALIFORNIA.**

In Plumas county, California. Formerly known as the Cosmopolitan. Was a producer, circa 1863, but idle many years. Opened by tunnels and shaft.

REWARD COPPER MINING CO.**ARIZONA.**

Mine office: Vekol, Pinal Co., Ariz. Has auriferous copper ores, with steam plant, 20-stamp mill and 20-ton cyanide plant.

REYNOLDS-ALASKA DEVELOPMENT CO.**ALASKA.**

Office: 60 Broadway, New York. Mine office: Valdez, Alaska. Employs about 25 men. Organized 1903, under laws of Washington, with capitalization \$3,000,000 shares \$1 par. Henry D. Reynolds, president; Frank R. Fuller, vice-president; Harriet A. Reynolds, secretary and treasurer; preceding officers, Hon. John G. Brady and Hon. Eben Smith, directors; Blamey Stevens, general manager. Lands, 33 claims, patented, area 660

acres, also 40-acre millsite and 6,000 acres of timber, coal and oil lands, in the Valdez district, showing 4 contact veins, or lenses, carrying chalcopyrite assaying about 11% for first grade and 3% to 7% copper for second grade ore, with gold values of \$2 to \$9 per ton. Development is by several small shafts and open cuts and 10 tunnels, of which the three longest are 140', 180' and 240', giving about 820' of underground openings. Has steam and water power, with 2-drill air-compressor, and is installing a 100-ton concentrator at the Aurora mine, this having 1 Gates crusher, 2 trains of Cornish rolls, 2 Huntington mills, 8 Frue vanners, amalgamating plates, etc. Company is free from debt and has clear title to lands, and property seems to be well managed and promising.

REX COBRE MINING CO.**ARIZONA.**

Office: Muskegon, Mich. Mine office: Safford, Graham Co., Ariz. Idle. Organized 1903, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Dr. B. D. King, president; J. B. Barlow, secretary and treasurer. Lands, 20 claims, area 320 acres, in the Lone Star district, showing fissure veins developed by a two-compartment incline shaft of 540', with 700' of underground openings. Has a 28-h. p. steam hoist.

REX GOLD MINES & INVESTMENT CO.**COLORADO.**

Mine office: Leadville, Lake Co., Colo. Jesse F. McDonald, manager. Operates the Rattler and Reconstruction mines, producing gold, silver, lead and copper. Has steam power and employed 20 men at last accounts.

COMPANIA MINERA LOS REYES.**MEXICO.**

Mine office: Zitacuaro, Michoacan, Mex. Rafael Rodriguez Gil, manager. Was developing a copper ore body by tunnel, with about 100 men, at last accounts.

REYNOLDS MINE.**VERMONT.**

Near the Elizabeth mine, at South Strafford, Orange Co., Vt. Idle.

RHODE ISLAND COPPER CO.**MICHIGAN.**

Office: 45 Broadway, New York. Mine office: Calumet, Houghton Co., Mich. Employs about 25 men. Organized 1899, under laws of Michigan, with capitalization \$2,500,000, shares \$25 par. Wm. R. Todd, president; W. A. O. Paul, secretary and treasurer; Thos. Dennis, superintendent; W. R. Todd, Isaac H. Meserve, Henry A. Wyman, C. J. Devereaux, John Baker and Jas. S. Dunstan, directors. Lands, 800 acres, north of the Franklin Junior.

No. 7 shaft, 275' north of the Franklin Junior boundary, is 8x18', with 3 compartments and is 500' deep, sunk on the Pewabic amygdaloid, which is 8' to 10' wide, with 2' to 3' near the hanging wall well mineralized at points. This shaft, abandoned 1902, is filled to the first level, on which it connects with No. 2 shaft, 1,200' to the northward, also 8x18' and 1,225' deep, having a frame shafthouse and Nordberg hoist capable of raising 2-ton skips from 1,000' depth. A crosscut, driven 180' east, encountered the Allouez conglomerate in March, 1903, and drifting on that lode was continued until July, 1904, when stopped, owing to lack of favorable ground. No. 2 shaft has crosscuts both east and west. The east crosscut, on the eighth level, at

a depth of 1,000', cut two apparently valueless amygdaloids, one being the Mesnard epidote. The East lode, about 5' wide, carries a little copper, but nothing especially encouraging. The West lode, 96' from the shaft and 7' to 9' wide, carries considerable copper in bunches. The four amygdaloids lying between the West lode and the Allouez conglomerate have been tested by drifting north and south, three proving barren. Principal work of 1904 was done on the West lode, upon the 8th level at 1,000' depth, this showing more encouraging ground at the close of the year. A crosscut was sent to the West lode on the 9th level, and development begun at the close of 1904.

Surface improvements include a 30x60' machine and blacksmith shop, a 30x50' frame warehouse and supply office and 15 dwellings. No. 2 engine house has a 12-drill Rand compressor, operating 2 power drills.

RHODESIA COPPER CO., LTD.

RHODESIA.

Offices: Salisbury House, London, E. C., Eng. Lord Gifford, chairman; Tom Donald, secretary; T. G. Davey, consulting engineer; Bechuanaland Exploration Co., Ltd., manager in South Africa. Organized Jan. 31, 1902, with capitalization £750,000, shares £1 par. Lands, 60,000 acres in farms, 400 square miles of miscellaneous lands and rights to locate 150,000 acres of farming land and 2,000 mining claims in northern Rhodesia. Company has located 290 claims on ancient copper workings. The Broken Hill mine has been opened by trenches and a tunnel, showing a 154' body of high-grade zinc ore. The Kitakata mine, one-half mile northeast of the Broken Hill, shows stains and hand-specimens of copper oxides and carbonates, and is to be opened by a shaft. Old copper workings were discovered in 1903, near the Bwana M'kubu, on which 20 claims, called the Stenbock, are located.

RICHARD III. DEVELOPMENT CO., LTD.

BRITISH COLUMBIA.

Office: Duncans, B. C. Mine office: Mt. Sicker, B. C. Lands include sundry claims near the Tyee mine, developed to depth of about 500', with good showing of ore on bottom level. Idle since spring of 1904, owing to lack of working capital.

RICHFIELD MINING & MILLING CO.

MEXICO.

Offices: Washington, D. C., and Nogales, Ariz. Mine office: Tuape, Arizpe district, Sonora, Mex. Arthur Harper, superintendent. Is developing the Dos Naciones and other claims showing silver, lead and copper ores. Main shaft, 150'.

RICHMOND GROUP GOLD MINES CO.

NEW MEXICO.

Office: Board of Trade Bldg., Boston, Mass. Mine office: Hillsboro, Sierra Co., N. M. E. F. Pearson, superintendent. Ores carry gold and copper. Has steam power and employed 10 men at last accounts.

RICHMOND & MONITOR MINES.

MONTANA.

Mine office: Saltese, Missoula Co., Mont. Chas. J. Heidenreich, manager. Lands are 6 miles southwest of Saltese. The Monitor mine has a 200' shaft, showing 12' of ore carrying good values in copper and gold. The Richmond has a 275' shaft. Ores assay up to \$60 per ton and show consider-

able native copper. Properties are worked during summer seasons only, and are said to yield a profit.

RIGBY MINING & REDUCTION CO.

ARIZONA.

Works office: Mayer, Yavapai Co., Ariz. Has authorized a \$200,000 bond issue. Col. T. Johns Rigby, president and general manager; F. H. Walker, secretary and treasurer; H. A. Clark, superintendent. Lands include sundry mining claims near Mayer. Company holds the Yavapai county rights to the Poehle & Croasland volatilization process and has built a reduction plant to treat crude ores and tailings. Works are of 125 tons daily capacity, so planned that size can be doubled if desired. Smelter site is 70 acres, one mile from Mayer. Furnace building is 88x132' with 5 revolving furnaces of 25 tons daily capacity each.

RINCON MINING CO.

ARIZONA.

Office: care of B. J. O'Reilly, secretary, Naco, Ariz. Organized under laws of Arizona, with capitalization \$2,500,000, shares \$25 par. Lands, 27 claims, 22 miles north of Benson, Cochise county Arizona, developed by a 130' tunnel showing ore giving assays up to 23% copper.

RINGING ROCKS COPPER MINING CO.

PENNSYLVANIA.

Mine office: Pottstown, Montgomery Co., Pa.

RIO ALTO COPPER CO.

COLORADO.

Capitalized at \$1,500,000, shares \$1 par, equally divided into 8% preferred and common stock. H. M. Comstock, general manager. Lands, said to be 300 acres in Northwestern township, Custer Co., Colo. Company claims to have 3½ miles of underground workings and to be building a 50-ton reduction plant, but neither statement has been verified.

RIO ARriba CONSOLIDATED MINES CO.

NEW MEXICO.

Letter returned unclaimed from former office, Milwaukee, Wis. Had claims near Tres Piedras, Taos county, New Mexico.

MINES DE CUIVRE ET DE PLOMB DE RIO FARDIS.

SPAIN.

Organized August, 1903, with capitalization 2,500,000 francs, shares 250f. par, to develop copper-silver-lead properties near Molinillo, Ciudad Real, Spain.

COMPANIA MINERA RIO GRANDE y DOLORES DE LONDRES.

MEXICO.

Offices: 37, Old Jewry, London, E. C., Eng. Mine office: Guadalupe, Guerrero, Mex. A. R. MacSwinney, manager. Operates La Nave mine, producing silver and copper. Has steam and water power, concentrator and leaching plant, employing about 40 men.

RIO GRIO DISTRICT COPPER CO., (TOBED &

SPAIN.

CODOS EXPLORATION), LTD.

Offices: 12, Lime St., London, Eng. Organized, Oct. 30, 1903, with capitalization £130,000, shares £1 par; issued, £97,987. Vicomte de Lassus, chairman; A. Fougere, consulting engineer; A. L. Lanseigne, secretary. Lands, 14 claims, in province of Zaragoza, Spain.

RIO HONDO COPPER CO.

NEW MEXICO.

Property sold to San Cristobal Copper Co.

RIO LUNA MINES CO., LTD.**SPAIN.**

Offices: care of J. N. Derbyshire, secretary, Nottingham, Eng. Mine office: Campo La Lomba, León, Spain. Capitalization, £120,000. Edward H. Pares, president. Lands, 135 hectareas, including the Riello mine, carrying auriferous and argentiferous copper sulphides. Idle at last accounts.

RIO RIMAL COPPER CO., LTD.**SPAIN.**

Offices: 9, Fenchurch St., London, E. C., Eng. Mine office: Figueras, Gerona, Spain. Organized, July 18, 1900, as Afortunada Copper Mines, Ltd., (name changed 1903 to present title), with capitalization £75,000, shares £1 par. Lands, area circa 12 hectareas, known as the Afortunada mines, held on perpetual lease from Spanish crown, at a rental of 236 pesetas yearly, plus 2% royalty on production.

RIO TENIDO COPPER MINES, LTD.**SPAIN.**

Voluntarily liquidated, April, 1903.

RIO TINTO MINE.**BRITISH COLUMBIA.**

A prospect at Beasley camp, 7 miles west of Nelson, B. C., said to show sulphide ores carrying assay values of about \$10 per ton. Idle.

RIO TINTO CO., LTD.**SPAIN.**

Offices: 30, St. Swithin's Lane, London, E. C., Eng. Spanish general offices: Huelva, Spain. Mine office: Nerva, Huelva, Spain. Employs 11,000 men. Chas. Wm. Fielding, chairman; Maj.-Gen. Sir Arthur E. A. Ellis, Lionel C. G. Sartoris, John MacFarlan, John M. MacDonald, directors; Alfred Charles de Rothschild and John M. McDonald, trustees for mortgage bondholders; Turquand, Youngs & Co., auditors; Commercial Bank of Scotland, Ltd., bankers; W. A. Carlyle, mine manager; J. Gordon McLeod and Saml. J. Bowes, joint secretaries; Duff, Bruce & Co., consulting engineers; R. E. Palmer, assistant manager; Geo. Davey, superintendent; Gordon Douglass, engineer.

Registered March 29, 1873, with capitalization £3,250,000, half in cumulative £5 preference and half in ordinary £5 shares. Warrants to bearer are issued in denominations of 1, 5, 10, and 25 shares. Debentures, £3,065,300, at 4%, redeemable at any time after June 30, 1905, on 28 days' notice.

Lands, about 16,000 acres freehold, some 60 miles inland from Huelva, 1,922 hectareas being denominated strictly mining lands, the principal mining operations of the company being in an area of approximately two square miles.

The Rio Tinto is much the most ancient of the great mines of the present day, and its history stretches back into the mists of antiquity. The first semi-authentic account of the mine dates from the Eleventh Century before Christ, when the Phoenicians traded in copper made from its ores. Carthage, that vigorous young offspring of Tyre, succeeded to the hegemony of the Iberian mines, and worked the Rio Tinto extensively for several centuries, being replaced, in turn, by the Romans, after the repulse of the second Punic invasion and the total overthrow of the Carthaginian power. The Rio Tinto was worked by the Romans for centuries, upon a very considerable scale, and, after the decadence of the Roman power, the mines were worked,

in a rather crude manner, by the Goths. Again the fortunes of war gave the Iberian peninsula to new masters, and the Moors in turn were owners and operators of this great copper deposit. After the expulsion of the Moors from southern Spain, under Ferdinand and Isabella, the mines fell into the hands of the Spaniards, and were reopened by them very early in the Sixteenth Century. The Spaniards, while among the world's best miners, and the pioneers of silver and gold mining in both North and South America, never paid close attention to copper or iron, and even at home, the Rio Tinto, although the property of the crown, was worked, during its most successful period, by foreigners, as it is to this day. In the Seventeenth Century the mine became a considerable producer, under the management of a Swede named Wolters, and in the following century did well under the direction of Tiquet, a Frenchman. In the Eighteenth Century the mine was leased by the crown to a company of English adventurers, of whom the leading spirit was Lady Maria Theresa Herbert. During the chaotic period of the French invasion, early in the Nineteenth Century, the mine was abandoned, and when reopened, in 1812, by the crown, was worked in but a small way. For the next sixty years the mine was under the management of various lessees, until sold outright, in 1873, to Matheson & Co., of London, for 92,800,000 pesetas, that firm organizing the present company, which has proven one of the most profitable mining corporation in existence.

Prof. J. H. L. Vogt estimates that the ancient miners extracted no less than 20,000,000 to 30,000,000 tons of ore from these mines. Lying above slag-piles left by the Phoenicians is a 10' bed of alluvium, on top of which are the Carthago-Roman slags. The smelting practice of the Romans apparently was very good, the slags left by them being as clean as those produced today. It is possible, however, that some of the copper left in the old slags has been leached out, during some 2,000 years of partial exposure to the elements. There are many remains of old machinery, especially sheave-wheels, shafts, etc., evidently used as parts of hoisting machinery. These relics of by-gone mining work invariably are of oak, and, if iron ever was used for such purposes, it turned to rust long centuries ago. There are also many potsherds, including miners' lamps of classic pattern, and Roman coins are found frequently. The Roman system of mining apparently was to cut narrow seams and slab off the ore in large masses, either by quicklime tamped into the crevices and wetted, or by wedging, and probably both methods were used, being those generally employed previous to the introduction of gunpowder for blasting.

The Rio Tinto mines are in the Sierra Morena range, the topography of the district being quite rugged. Ore bodies occur as mammoth lenses, with slate and clay walls on porphyry, and are surmounted by immense gossan cappings, considerably decomposed and quite easily broken for removal. The surface ore has been leached to the point of absolute worthlessness, the zone of secondary enrichment beginning at a depth of approximately 100', and continuing down to about 300'. The mine has 4 veins,

or series of lenses, known as the North, Middle, South and Valley, with mines opened on each, two of the mines being worked open-cast and two by regular underground stopes. The underground mines are worked pillar-and-stall, with levels every $12\frac{1}{2}$ metres, levels being opened 4 metres high, and the entire floor divided into galleries and crosscuts of 4x4 metres, leaving pillars of 6x6 metres, which seems a rather ineffective method. The deepest shaft, nearly 1,200', is in the San Dionisio mine, on the Middle vein. The principal workings are open-cast, where the capping is sliced down in terraces, and the ore mined in terraces also, cars being brought in by locomotives to as great a depth as practicable, both in stripping and quarrying. The possibility of using the caving system for underground mining has been considered. The principal disadvantage of underground mining is the scarcity and high price of wood for timbering, and the extensive use of wood would be obviated by the adoption of the caving system. Diamond drill borings show untouched ore bodies of upwards of 130,000,000 gross tons, giving sufficient reserves for nearly 70 years' production at the present rate of mining. Upwards of 1,000,000 cubic metres of overburden are stripped per year, normally.

The ores carry an average of 1.5 oz. silver per ton, with traces of gold, and considerable silver is saved by the Claudet process at the smelter. The ores are rich in sulphur and are assorted into three classes, of which the smelting ore carries 5% to 6% copper, the export ore about 3.5% copper and 45% to 50% sulphur, and the leaching ore 1.75% to 2% copper. The average percentage of copper carried by the ores treated has ranged from 1.5% in 1876, the first year of production, to 3.234% in 1884, the average of copper extraction in 1903 being 2.39%. About half of the ore produced is smelted, balance being leached or sent abroad to burners. The ores average 4% to 5% copper in the zone of secondary enrichment, and gradually decline in value with depth, until at about 1,000' the average is only about 1.25%. The ore bodies are chalcopyrite, sparingly disseminated in solid iron pyrites rich in sulphur. Reserve heaps at the mine were estimated, at close of 1903, to contain 147,685 long tons of fine copper. Production of the mine, in 1903, was 35,810 long tons of refined copper, from 1,918,538 long tons of ore, of which 688,919 tons were shipped and 1,229,619 tons were treated locally. The copper output of the mine has shown practically no change since 1898. Owing to their richness in sulphur, the shipping ores of the Rio Tinto are in good demand, and in addition to supplying various British works, are exported to Germany, France, Belgium and sundry seaboard acid works of the United States. The bulk of the medium-grade ore is shipped to the company's works at Cwm Avon, Wales, where it is burned for sulphur, and the cinder treated by the Henderson wet process for the extraction of copper. Production of the mine is divided into approximately 60% of blister copper, from smelting ores, and 40% of copper secured from the residue of ores shipped to various sulphur burners.

Owing to the system of mining and reduction followed by the Rio Tinto, the mechanical equipment of the mine is not especially extensive, and there

are none of the immense hoists and powerful machinery found at the other great copper mines of the world. This is not due to lack of enterprise, but to the fortunate fact that much of the production is won open-cast, while the underground workings are neither deep nor extensive. The methods of *lixiviation* followed by the Rio Tinto are explained at length in the chapter on metallurgy. In addition to the amount of copper estimated to be carried in the *teleras*, or leach-heaps, there are upwards of 100,000 long tons of copper in the *tereros*, or waste-heaps. Owing to the alteration of heavy rainfalls with protracted seasons of drought, water storage is necessary, large dams having been constructed for that purpose. The ore leached at the mines is no longer calcined, the copper becoming soluble by natural weathering, assisted by systematic sprinkling, and scrap-iron formerly used for precipitation has been superseded by pig-iron from Bilbao. About 7,000,000 gallons of leach-water, strongly charged with copper in solution, are treated daily in the *lixiviation* plant.

The smelting plant at the mine was blown in January, 1902. The smelter has two 42x160" elliptical water-jacket cupolas, 23' 4" over all in height, with charging doors 10' above the bottoms, which are detachable and mounted on wheels. Each furnace has 8 water-jackets and 2 charging doors, ore and fuel being charged alternately. The furnaces discharge continuously into settlers, 12' in diameter and 40" high, of 30 tons capacity, which have continuous slag discharge. The matte, running 29% to 34% in tenor, is taken to converters in 8-ton ladles by electric traveling cranes. The *bessemerizing* plant has 6 stands of converters, shells being of the horizontal barrel type, 80" in diameter and 120" long, with 12 tuyeres and spherical valves. Converters are rotated hydraulically from an elevated stand. The shells are in two parts, for convenience in lining, and are double-lined with a 4" external course of fire-brick, rarely replaced, and an inner section, 22" to 26" thick, of ground silica and low-grade quartzose copper ores, with 10% of clay for binder. When newly lined the shells have a capacity of only 3 to 4 tons each, increasing to about 8 tons when the inner linings are nearly burned out. Product is shipped as converter bars of 98% to 99% in tenor. The company also has extensive acid works and smelters at Cwm Avon, Wales. The Huelva & Rio Tinto railway, owned by the company, runs 60 miles from the mines, at Nerva, to the port of Huelva, where the company has extensive wharves and terminals, this being the largest private port in the world, loading and unloading 30 to 40 ocean steamers monthly. The railroad does a general freight and passenger business, in addition to transporting ore and fuel, and returned profits of £14,694 in 1901. The company owns the steamer *Don Hugo*, of 1,249 tons registered burden, plying between Spain and Wales.

The Rio Tinto employs nearly 11,000 men in Spain, of which number about 75 members of the staff are British, the balance being Spaniards, the latter earning average wages of 15 reals, equal to about 60 cents per day of 8 and 9 hours. There is no Sunday work and the men are paid daily, the labor being both docile and efficient.

The following table gives a summary of operations for three years

	1901.	1902.	1903.
Profits, rents, etc	\$9,055,750	\$7,206,530	\$8,458,615
Dividends paid	6,274,025	4,443,780	6,073,435
Reserve and depreciation	704,770	649,330	512,260
Ordinary dividend	72½%	50%	70%

The management of the Rio Tinto is excellent in all respects, being conservative without stupidity, and progressive without rashness. Despite its three thousand years of existence, the Rio Tinto never was so good a mine as now, and never had so much ore proven for future extraction.

RIO TINTO COPPER MINING CO.

WYOMING.

Organized September, 1902, under laws of Wyoming, with capitalization \$1,000,000, by residents of Encampment, Wyo., and Lincoln, Neb.

RIO TINTO GOLD & COPPER CO.

ARIZONA

Office: Grant Bldg., Los Angeles, Cal. Mine office: Prescott, Yavapai Co., Ariz. E. P. Thom, secretary; A. J. Varney, manager. Lands, 16 claims, in the Black Hills district, opened by two 70' shafts showing ore giving assays up to \$15 per ton. Apparently idle.

COMPANIA MINERA RIO TINTO MEXICANA.

MEXICO.

Office: Chihuahua, Mex. Mine office: Terrazas, Chihuahua, Mex. Juan A. Creel, general manager; Dennis Monihan, superintendent. Has auriferous and argentiferous copper ores, opened by a 300' main shaft, and late in 1903 struck 3% nickel ore, apparently in considerable quantities. Has steam power and a 200-ton smelter. Resumed work in 1904.

RIO VISTA GOLD & COPPER MINING CO.

CALIFORNIA.

Office: 31 Chronicle Bldg., San Francisco, Cal. Mine office: Fairplay, Eldorado Co., Cal. Organized January, 1901, under laws of South Dakota, with capitalization \$1,000,000, shares \$1 par. E. P. Colgan, president; D. E. McKinlay, vice-president; F. H. Hood, secretary and general manager; A. G. Gurnett, treasurer. Lands, 2 patented claims, area 40 acres, 3 miles from Fairplay, known as the Consumnes mine, on the Consumnes river, showing a 23' vein with 4' pay-streak giving average assays of about 15% copper and \$10 gold and silver per ton, from malachite and bornite, opened by a 225' shaft with steel gallows-frame, and 500' of tunnels, the Volcano tunnel showing a 10' vein of bornite. Mine has water power, compressed air hoist and 3-drill Rix compressor, using baby drills, and is building a 30-ton smelter. Company is composed of men of good standing and property is considered promising.

RIISING SUN COPPER MINING & SMELTING CO.

NORTH CAROLINA.

Office: 241 Equitable Bldg., Baltimore, Md. Mine office: Mt. Washington Station, North Carolina.

RIVERSIDE COPPER CO.

ARIZONA.

Office: Phoenix, Ariz. Mine office: Morristown, Maricopa Co., Ariz. Idle. Organized under laws of Arizona, with capitalization \$2,000,000, shares \$1 par. J. M. Graybill, president; Isaac T. Stoddard, agent. Lands,

2 patented and 6 unpatented claims, in the Vulture Mountains, showing self-fluxing carbonate ores. The Copper Bottom claim also shows a good body of slightly argentiferous galena. Property is well considered.

ROB ROY MINING CO.**UTAH.**

Office: care of Edward McGurrin, secretary and treasurer, Salt Lake City, Utah. Emanuel Rauch, president. Capitalization, \$75,000. Lands, 4 claims, on Clipper hill, Bingham Canyon, Salt Lake county, Utah.

NEGOCIACION MINERA LA ROCA NEGRA.**MEXICO.**

Mine office: Velardeña, Durango, Mex. Ernest E. Paine, manager. Operates La Roca and La Victoria mines, producing gold, silver, lead and copper. Main shaft, 500'. Possibly sold to American-Mexico company.

LA ROCA-NEGRITA MINING CO.**MEXICO.**

Apparently sold to American-Mexico company.

ROCK LAKE MINING CO., LTD.**ONTARIO.**

Company in liquidation. Fully described in Vol. III.

ROCKLAND COPPER CO.**BRITISH COLUMBIA.**

Mine office: Silverton, B. C.

ROCKY MOUNTAIN CONCENTRATING & MILLING CO.**COLORADO.**

Mine office: Black Hawk, Gilpin Co., Colo. Edgar S. Moulton, manager. Ores carry gold, silver and copper. Has gasoline power, 25-stamp mill and 75-ton concentrator.

ROCKY MOUNTAIN COPPER CO.**WYOMING.**

Office: Marcellus, Mich. Mine office: Encampment, Carbon Co., Wyo. Organized August, 1902, under laws of Wyoming, with capitalization \$100,000, shares 10c. par. Geo. W. Kroll, president; Earle R. Clemens, vice-president and general manager; Arthur E. Bailey, secretary; J. V. Goodwin, superintendent. Lands, 8 claims, area 160 acres, in the Upper Platte district, showing oxide and carbonate ores in gossan, opened by sundry pits and shafts, deepest 55'. Was doing development work with a small force at last accounts.

RODMAN MINING & MILLING CO.**NORTH CAROLINA.**

Office: Brooklyn, N. Y. Has one small mill and is building a second, on its property in Guilford county, North Carolina.

BERNARDINO RODRIGUEZ.**MEXICO.**

Office and mine: Mazapil, Zacatecas, Mexico.

SEVERIANO RODRIGUEZ.**MEXICO.**

Office and mine: San Pedro Ocampo, Zacatecas, Mexico.

ROGERS MINING CO.**COLORADO.**

Mine office: Pearl, Larimer Co., Colo. Controlled by National Mining & Milling Co.

ROGERS COPPER & IRON CO.**TENNESSEE.**

Office: McComb, Ohio. Mine office: Ducktown, Polk Co., Tenn. Organized June, 1902, under laws of South Dakota. C. H. Shuler, president; C. S. Hoskinson, vice-president; W. J. Stark, secretary; C. C. Glecker, treasurer; J. A. Ewing, general manager. Property is 300 acres of copper and iron lands, in the extreme southeastern corner of Tennessee.

LA ROMANERA GROUP.**SPAIN.**

Office: care of M. Yglesias, owner, 2, Tokenhouse Bldgs., London, E. C., Eng. Group includes the San Vicente and other mines, near Paimogo, Huelva, Spain, showing several veins, largest about 40' wide at top and increasing with depth, carrying cupriferous iron pyrites, with gold and silver values.

ROOSEVELT GOLD & COPPER MINING CO.**ARIZONA.**

Office: care of W. G. McDonald, president and general manager, P. O. Box 477, Bisbee, Ariz. Property is 15 miles from Ft. Thomas, Graham county, on the Gila Valley, Globe & Northern R. R., developed by a 60' shaft showing cuprite, malachite, chalcocite and chalcopyrite giving good assay values.

RÖROS KOBBERVAERK.**NORWAY.**

Mine office: Røros, Trondjhem, Norway. A group of old mines, opened circa 1646, including the Storvarts, Kongens, Kristian VI. and Muggruben, these being owned partly by the state. Employed 600 men in 1901. Ores range 4.5% to 5% in the Kongens group; 6% to 7% in the Storvarts, and about 5% copper in the Muggruben. A little prospecting has also been done on an adjoining group of claims. Production in 1898 was 1,383,077 lbs. refined copper, and in 1902 was about 25,000 tons of ore averaging 5% to 6% copper after roasting.

ROSA AMARILLA COPPER CO.**MEXICO.**

Office: 33 Portland Blk., Chicago, Ills. Mine office: Pueblo Nuevo, Jalisco, Mex. Employs 30 men. Organized 1904, under laws of Maine, with capitalization \$5,000,000, shares \$1 par. A. L. Dewar, president; Danl. Campbell, vice-president; F. W. Harnwell, secretary; L. E. Fuller, treasurer; John Mann, superintendent; John A. Kruse, engineer. Lands, 5 groups, including the Rosa Amarilla and Ethel copper groups, and the Talpurito silver group, area circa 300 acres, in the Autlán district, also right for three years to prospect and locate claims within an area of 30 kilometres square, or nearly 400 square miles. Also has 3 water rights denounced and has leased a timber tract of 1,800,000 acres, which will furnish timber at practically cost of cutting. Control of the Mexican properties is held through the Rosa Amarilla Copper Co., S. A., organized under laws of Mexico.

Lands show 4 ore bodies, probably lenses, averaging 100' and upwards in width, with outcrops traceable for several miles. An average of upwards of 300 assays gives 7.8% copper, 6 oz. silver and a trace of gold from oxide, carbonate and sulphide ores of copper. Development is by 105' shaft and 4 tunnels, in addition to which some diamond drilling has been done. Property is 26 miles from the Pacific and company controls a harbor known as Puerto de Natividad. A road between the mine and port can be built with a grade not exceeding 4% at any point, and averaging about 100' per mile. Coke from Japan can be delivered at dock at about \$8 per ton. Company plans to install its own sawmill and planing mill.

MINA EL ROSARIO.**CHILE.**

Mine office: Tamaya, Ovalle, Chile. Owned by the Familia Lecaros. Mine was opened in 1850 and is about 550' deep. Idle.

COMPANIA MINERA ROSARIO.**ARGENTINA.**

Property is located in the Calamuchita district, about 60 miles southwest of Córdoba, Argentina. Ore body is iron pyrites carrying chalcopyrite, with quartz gangue, averaging 5% to 6% copper. Has a smelter with 36" blast-furnace, making matte averaging 65% copper and 30 oz. silver per ton, which is sent to Great Britain for reduction and refining.

ROSE MINE.**CALIFORNIA.**

Office: care of R. S. Grant, owner, Victor, Cal. Property is in the Morongo district, 45 miles southeast of Victor, San Bernardino Co., Cal. Ores carry copper, gold and silver, the copper ore being hand-sorted and shipped to smelter when property is worked.

ROSEMAN GROUP.**CALIFORNIA.**

Office: care H. Roseman, et al, owners, Redding, Shasta Co., Cal. Lands, 9 claims and smelter site. Property is slightly developed by shafts and tunnels, showing oxide and carbonate ores near surface, with sulphides at slight depth.

ROSEMONT COPPER CO.**ARIZONA.**

Mine office: Rosemont, Pima Co., Ariz. Has steam power and 50-ton smelter. Idle.

ROSEWOOD CREEK COPPER & GOLD**AUSTRALIA.****MINING CO., LTD.**

Offices: 7A., Upper St. Martin's Lane, London, W. C., Eng. Organized July 31, 1903, as reconstruction of the Great Northern Copper & Gold Mining Co., of Queensland, with capitalization £100,000, shares 5s. par. R. K. Evans, secretary. Lands, 265 acres, in the Rosewood goldfield of Queensland, Australia.

ROSSLAND-KOOTENAY MINING CO., LTD.**BRITISH COLUMBIA.**

Offices: Salisbury House, London, E. C., Eng. Mine office: Rossland, B. C. Bernard MacDonald, general manager; F. A. Labouchere, secretary. Registered May 17, 1902, as reconstruction of Rossland-Great Western Mines, Ltd., and Kootenay Mining Co., Ltd., with capitalization £150,000. Lands, 204 acres, carrying gold, silver and copper ores, which are shipped to the Northport smelter when property is operated.

ROUILLARD COPPER MINES.**NEW HAMPSHIRE.**

On Mt. Gardner, near Woodsville, Grafton Co., N. H. Idle since 1902.

ROUSE-GARDNER MINING CO.**COLORADO.**

Mine office: Central City, Gilpin Co., Colo. J. W. Bostwick, manager. Operates the Gardner mine, carrying gold, silver and copper. Has steam power and employed about 25 men at last accounts.

ROUTT COUNTY GOLD & COPPER MINING CO.**COLORADO.**

Office: 635 Seventeenth St., Denver, Colo. W. T. Perkins, president; F. E. Coe, secretary and treasurer. Organized March, 1903, under laws of Wyoming, with capitalization \$1,500,000, shares \$1 par. Lands, 5 claims, area 50 acres, in Routt county, Colorado, 100 miles from nearest railroad, developed by about 1,000' of tunnels and showing a considerable quantity of ore assaying \$3.50 to \$150 per ton, in gold, copper, silver and lead.

ROWAN GOLD & COPPER MINING CO.**NORTH CAROLINA.**

Office: Salisbury, N. C. Alvin Merriam, superintendent. Operates the Oddie gold-copper mine. Has steam power and 10-stamp mill, and leaches concentrates by the Mead process

ROYAL COPPER CO.**NEW MEXICO.**

Property sold, 1901, to Aberdeen Consolidated Gold & Copper Co.

ROYAL CROWN MINING CO.**MEXICO.**

Office: Independencia No. 38, Oaxaca, Mex. Mine office: Ocotlán, Oaxaca, Mex. Organized under laws of Mexico, with capitalization \$300,000, shares \$1 par; paid in, \$135,000. Gustavo Stein, president; Teodoro Meyer, secretary and treasurer; A. Hopley Woolrich, general manager; Martin Aguirre, superintendent. Lands, 80 acres, also a 10-acre smelter site, in the Ocotlán district, showing 4 contact veins between quartzite and andesite, of which two are being developed, these averaging 3 metres width and giving average assays of 13% copper, 739.66 grams silver and \$23 gold per ton, from malachite, azurite and chrysocolla in the oxidized zone, and chalcopryite below the water-level. Is opened by shafts of 122' and 125' and served by the Ocotlán & Ejutla railway, ½ mile distant. Employed 75 men at last accounts.

ROYAL GOLD & COPPER CO.**UTAH.**

Office: Dooly Blk., Salt Lake City, Utah. Mine office: Milford, Beaver Co., Utah. Organized March, 1903, under laws of Colorado, with capitalization \$10,000,000, shares \$10 par. A. B. Lewis, president and general manager; C. J. Caughey, vice-president; Frank Knox, treasurer; Jos. Henshaw, secretary. Lands, 200 claims, area 4,000 acres, including the Montreal, Gogebic, Colossal, Lewis, Beacon, Nellie, Monitor, Adams, Muldoon and other groups, in Beaver, Washington and Iron counties, Utah, but mainly in the vicinity of Milford. The Montreal group is the best known, and it is asserted that upwards of \$1,000,000 in copper, lead, silver and gold has been produced by this property in the past. Is undergoing development, and company has authorized a \$2,000,000 bond issue at 6%. The Royal company apparently has been partially or wholly absorbed by the Nevada-Utah company.

ROYALBERG COPPER MINES, LTD.**NORWAY.**

Offices: 64, Victoria St., London, S. W., Eng. Mine office: Kongsberg, Norway. Registered April 24, 1903, with capitalization £40,000, shares £1 par; issued, £35,000. S. Philip Eastick, managing director; J. L. Loughley, secretary; Ingwolf Otterbeek, superintendent. Lands, 18 claims, area circa 50 acres, title by crown grant, also 20 acres timber lands, in the Fiskum district, opened by shafts of 40', 70', and 100', and by tunnels of 120' and 250', showing four 3' fissure veins in volcanic mica-schists, giving average assays of 14% copper, 20% lead, 10% zinc and 24 oz. silver per ton, from sulphide ores, and estimated to show 30,000 tons of ore, with 15,000 tons blocked out for stoping. The West Norway railroad is 2 miles distant, and it is proposed to develop 100-h. p. from a nearby waterfall.

RUBY COPPER & GOLD MINING CO.

WYOMING.

Mine office: presumably Encampment, Carbon Co., Wyo. Has steam power and was developing on a small scale in 1903.

RUBY GOLD & COPPER CO.

MEXICO.

Office: 30 Broad St., New York, N. Y. Mine office: San Marcial, Sonora, Mexico. Floyd B. Wilson, president and counsel; Henry J. Davison, vice-president; Fredk. K. Jones, secretary and treasurer; Chas. R. Davenport, superintendent. Organized Nov. 28, 1900, under laws of Arizona, with capitalization \$2,000,000, shares \$10 par, in \$1,900,000 common and \$100,000 cumulative 10% preferred stock. Mine carries ores of gold and copper. Was installing mining machinery and reduction plant at last accounts.

RUBY MINING CO.

WASHINGTON.

Office: care of A. B. Lee, Wooster, Ohio. Mine office: Nighthawk, Okanogan Co., Wash. Organized under laws of Washington with capitalization \$1,500,000, shares \$1 par. J. M. Haggerty, president; Monroe Harmon, vice-president and general manager; C. B. Bushnell, secretary and treasurer. Lands, sundry claims, 75 miles from a railroad, on Mt. Chopaca, on which considerable development has been secured, and mine has made small smelter shipments of medium-grade ores.

RUBY HILL COPPER MINING & SMELTING CO.

CALIFORNIA.

Mine office: Copper City, California.

RUBY HILL TUNNEL & MINING CO.

NEVADA.

Mine office: Eureka, Eureka Co., Nev. Was driving a 2,200' tunnel between the Richmond and Connor mines at last accounts.

RUBY KING COPPER MINING & TOWNSITE CO.

CALIFORNIA.

Lands, 11 claims in Sections 29 and 32, T. 17 N., R. 6 W., Colusa county, California, showing float copper.

RUDEFEHA MINE.

WYOMING.

Absorbed by North American Copper Co.

RUDIANSKI MINES.

RUSSIA.

Office: care of T. L. Zamiatnin, Perm, Russia. Property is a group of mines in the government of Perm. Latest reported production was 3,122,112 lbs. fine copper in 1899.

SOCIEDAD ANONIMA COBRES DE RUESGA.

SPAIN.

Office: Bilbao, Spain. Mine offices: San Martin de Los Herreros, Palencia, Spain, and Dehesa de Montojo, León, Spain. Organized 1901, with capitalization 1,500,000 pesetas, shares 500 pesetas par. Don Julio Lazúrtigui, president; Don Augustin Cortina, secretary. Property includes the Leonor and adjoining mines, which were under investigation at last accounts.

MARCOS RUSSEK.

MEXICO.

Office and mine: Jiminez, Chihuahua, Mexico.

RUSSELL UNITED COPPER CO.

ARIZONA.

Dead. Lands sold to Arizona Consolidated Mining Co.

RUTHBERG CONSOLIDATED COPPER CO.**IDAHO.**

Letter returned unclaimed from former office, Banigan Bldg., Providence, R. I. Lands were 112 acres, in the Seven Devils district of Idaho.

SACAJEWEA GOLD & COPPER MINING CO.**MONTANA.**

Office: care of W. J. Anson, secretary, Helena, Mont. Capitalization \$5,000,000, shares \$10 par. Colonel Henry Altman, president. Lands, 47 claims, in vicinity of Helena, Lewis & Clarke county, Montana.

SADDLE MOUNTAIN MINING CO.**ARIZONA.**

Office: 1008 F St., Washington, D. C. Mine office: Dudleyville, Pinal Co., Ariz. Employs 50 men on development work. Organized 1902, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Dr. Z. Taylor Emery, president; Clarence Stephens, vice-president; Storey B. Ladd, secretary; Wilbur W. Delano, treasurer; Geo. B. Chittenden, general manager; N. H. Mellor, superintendent; Jas. H. Myers, smelter superintendent. Lands 32 claims, area 550 acres, surveyed for patents, with a 40-acre smelter-site and sundry coal lands, to be developed later, also lands in Pinal and Gila counties, giving total holdings of 3,400 acres. Has a contact vein between limestone and porphyry, showing carbonate ore with garnet gangue on the limestone wall, and sulphides along the porphyry contact at depth, ores averaging 4% copper and 2 oz. silver per ton. Has shafts of 50', 120', 125' and 300', also 3 crosscut tunnels and 5 tunnels in ore, longest 350' and 600', giving about 3,500' of openings. Property was discovered about 1880, but after slight development was found to be in the San Carlos Indian reservation, hence was closed down until restored to the public domain by executive orders of the president, December 2, 1902. Has a 20-ton concentrator, with jaw-crusher and Bartlett table, also had an old smelter with 2 small water-jacket blast furnaces, erected in 1880 by the San Carlos Copper Co. A test run with the old smelter was made, January, 1905. The furnace treated 48 to 55 tons daily, charges being composed of 65% ore from open-cuts, 20% of pyritic ore from mine, 5% slag and 10% Trinidad coke. Slags therefrom assayed 34% SiO₂, 24% FeO, 9% CaO, and matte, from charges made without addition of barren flux, ran 50% to 55% copper, 10 oz. silver and \$6 gold per ton. Ores were taken without sorting and gave net smelter returns of about 3.5% copper. Actual cost of smelting was \$2.90 per ton. The old smelter, built 1884, was torn down immediately after the test, and a new 150-ton matting furnace is being erected and should be blown in about June or July, 1905.

The company has developed large ore bodies by open-cuts and has coal for steam use on its own lands, 5 miles distant. Management is good and property is much above the average in promise.

SADO MINE.**JAPAN.**

Owned and operated by the Mitsu Bishi Goshi Kwaisha.

SAHUARIPA EXPLORATION CO.**MEXICO.**

Mine office: Sahuaripa, Sonora, Mex. Has bought and bonded a number of properties in the Sahuaripa district, among these being the Mina Esperitu Santo, 12 miles east of Sahuaripa, opened circa 1842, and closed in 1900,

owing to striking of water. This has a blanket vein of argentiferous and plumbiferous tetrahedrite, carrying up to 250 oz. silver per ton.

SAHUAYACAN MINING CO.**MEXICO.**

Office: Pittsburg, Pa. Mine office: Jesus Maria Ocampo, Chihuahua, Mex. Leo Reed, manager. Operates the Veronica and other mines, producing gold, silver and copper. Main shaft, 350'. Has steam power and a 20-stamp mill, employing about 100 men.

SAGINAW DEVELOPMENT CO.**ARIZONA.**

Office: care of W. B. Mershon, president, Saginaw, Mich. Mine office: Bisbee, Cochise Co., Ariz. Employs 22 men. Organized March 30, 1904, under laws of Arizona with capitalization \$1,000,000, shares \$10 par; issued \$500,000. F. L. Harrington, vice-president and general manager; George Grank, secretary and treasurer. Lands, 17 claims, including the World's Fair and Muheim groups, area 297 acres, favorably located near some of the best mines of the Warren district. Development is by an old shaft of 384', sunk at an average angle of 70° by former owners, showing 35' of leached ore on the 300' level, and the new "Saginaw" 3-compartment vertical shaft, 566' deep at end of 1904. The new shaft cut a bunch of carbonate ore at 200' and passed through the conglomerate capping at 420'. The new shaft has a 22-h. p. Fairbanks & Morse gasoline hoist, soon to be replaced by a permanent steam plant. Some diamond drilling has been done also. The new plant will include a 2,000-gallon pump to care for heavy inflow of water that may be expected at or about 1,000' depth. Management is excellent, both at the mine and in the east, and property has more than an even chance of developing into a big mine.

SAGINAW MINE.**MONTANA.**

Letter returned unclaimed from Dillon, Beaverhead Co., Mont.

SAGINAW MINING CO.**WASHINGTON.**

Mine office: Maple Falls, Wash. Has copper-gold ores.

SAGINAW VALLEY COPPER MINING CO.**WYOMING.**

Office: Bay City, Mich. Letter returned unclaimed from former mine office, Encampment, Carbon Co., Wyo. Organized 1902, under laws of Wyoming, with capitalization \$2,000,000, shares \$1 par. E. L. Beach, president; Alex. Zagelmeyer, vice-president; J. E. Hawkins, secretary; Herman R. Marwinske, treasurer; Jos. Walton, superintendent. Has absorbed the Green Mountain and Grand Rapids Copper companies, exchanging stock therefor. Lands, 100 acres, developed by 100' shaft and 73' tunnel. Treasury empty and property idle at last accounts.

ST. CROIX CONSOLIDATED COPPER CO.**WISCONSIN.**

Office: Superior, Wis. Organized 1903, under laws of Wisconsin, with capitalization \$1,500,000, shares \$1 par. Lands, 9 groups, area 22,000 acres, in Douglas county, Wisconsin, carrying the western extension of the Keweenaw copper belt of Michigan. Idle at last accounts.

ST. DAVID'S GOLD & COPPER MINES, LTD.**WALES.**

Succeeded, 1903, by St. David's Gold Mines (1903), Ltd. Old company dead, but unable to get itself legally buried.

ST. DAVID'S GOLD MINES (1903), LTD.**WALES.**

Offices: 29, Cornhill, London, E. C., England. Mine office: Barmouth, North Wales. Organized July 21, 1903, as a reconstruction of St. David's Gold & Copper Mines, Ltd., with capitalization £60,000, shares 5s. par; fully issued and 4s. 6d. paid in. Debentures, £40,000 at 6%. G. C. Isaacs, chairman; E. T. McCarthy, consulting engineer; D. J. Paterson, secretary. Lands, 730 acres, carrying gold and silver ores. Has a 50-stamp mill and Elmore oil concentration plant. Paid a 5% dividend, July, 1904.

ST. GEORGE COPPER MINING CO.**UTAH.**

Office: Salt Lake City, Utah. Mine office: St. George, Washington Co., Utah. Capitalization \$400,000. Clarence McCornick, president; Grant C. Snyder, secretary and manager; B. L. Cutler, superintendent. Lands are in Dugway Mountains. Main shaft, 100', on a 4' to 5' vein, giving assays of 4% to 40% copper. Has gasoline power and a small smelter, and is doing systematic development work. Management good and property well regarded.

ST. JOE MINING CO.**UTAH.**

Office: 61 Commercial Blk., Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. Capitalization \$1,000,000, shares \$1 par. R. A. Hasbrouck, president; Wm. S. Burton, secretary. Lands, 17 claims, area 340 acres, having more than a mile of underground openings. Principal opening is the St. Joe deep tunnel, planned to be driven about a mile.

ST. JULIAN MINING CO.**MONTANA.**

Office: Livingston, Mont. Mine office: Chico, Park Co., Mont. J. F. Nolan, manager. Lands include the Bercry, Bullion and Copper Queen claims, carrying gold, silver and copper. Has steam power and Elspass mill.

ST. LAWRENCE GROUP.**WASHINGTON.**

Office: 312 Trader's Blk., Spokane, Wash. Owned by W. R. Marvin, T. H. Boyd and P. F. McLaughlin. Lands 4 claims, in the Twisp district, Cascade Mountains, Washington, about 60 miles from a railroad, showing a strong vein giving assay values of about \$40 per ton in copper, gold and silver.

ST. LOUIS MINE.**NEW MEXICO.**

Mine office: Silver City, Grant Co., N. M. Geo. Newcomb, manager. Has shipped ores averaging 15% to 25% copper to smelter. Main shaft 500'. Has solid sulphides below 200', oxidized ores above. Owners said to contemplate installing a leaching plant to treat 5% to 20% ores.

ST. LOUIS MINE.**WASHINGTON.**

Mine office: Silverton, Snohomish Co., Wash. Has vein of 18 "to 36", showing auriferous and argentiferous chalcopyrite assaying 20% copper.

ST. LOUIS COPPER CO.

Former office: 721 Olive St., St. Louis, Mo. Dead.

ST. LOUIS COPPER CO.**ARIZONA.**

Mine office: Gila Bend, Pima Co., Ariz. A. J. Shotwell, superintendent. Ores carry gold and copper. Had steam power and 10-stamp mill at last accounts. Probably same as either Ajo or Shotwell-Trimountain.

ST. LOUIS-VASSAR MINE.**UTAH.**

Mine office: Park City, Summit Co., Utah. Robert Gorlinski, manager. Ores carry mainly silver, with fair values in copper, lead and gold.

ST. MARIE COPPER CO.

Former office in the Cooper Bldg., Denver, Colo. A swindle, perpetrated by John Reilly and W. W. Wilson, two notorious confidence men.

ST. MARY'S MINERAL LAND CO.**MICHIGAN.**

Office: P. O. Box 5095, Boston, Mass. Local office: Houghton, Houghton Co., Mich. Employs 45 men at the Challenge mine. Organized 1901, under laws of New Jersey, with capitalization \$5,000,000, shares \$25 par; issued, \$3,498,250. Company holds the entire stock issue, except founders shares, of St. Mary's Canal Mineral Land Co., organized 1863, under laws of New York, to take over lands given by the state for construction of the first ship canal at Sault Ste. Marie, lands so given being 180,000 acres in Houghton, Ontonagon and Keweenaw counties, and from which tract the Calumet & Hecla, Tamarack, Baltic, Trimountain, Champion and other mines have been developed. Nathaniel Thayer, president; Chas. J. Paine and J. Henry Brooks, vice-presidents; Arthur G. Stanwood, secretary and treasurer; preceding officers, Samuel N. Brown, Albert S. Bigelow, Chas. E. Perkins, Geo. P. Gardner, Walter Hunnewell, Chas. N. King and Nathaniel H. Stone, directors; R. R. Goodell, local manager; Dr. L. L. Hubbard, mine superintendent; Wm. Skewes, mining captain.

Lands, 96,989 acres in fee, and mineral rights to 14,193 additional acres, lands being scattered along the Lake Superior copper belt, with principal holdings on the South Range, southwest of Houghton. No lands were sold during 1904. Other assets are, 50,000 shares of stock of the Champion Copper Co., being a one-half interest in that corporation; 20,000 shares Pacific Copper Co.; 208 shares Copper Range Consolidated Co.; 842 shares Winona Copper Co.; 80 shares Old Colony Copper Co.; 25,000 shares Mayflower Mining Co. From 1863 to 1900 the old company paid cash dividends of \$2,200,000, also stock dividends of one share of Tamarack, one share Iroquois, $1\frac{1}{2}$ shares Baltic, $\frac{1}{2}$ share Winona and $\frac{1}{2}$ share Albany & Boston, on each share of St. Mary's stock. Receipts for 1904 were \$151,105.83, and expenditures were \$205,910.12, including a dividend of \$150,000. Company paid a similar dividend in 1903, giving total dividend disbursements of \$300,000. Of the 1904 income, \$100,000 was received from dividends paid by the Champion Copper Co.

Extensive diamond drill borings were made on the St. Mary lands south of the Champion mine and near the Winona mine. Drilling was discontinued in 1904 and work begun on the opening of a new mine, called the Challenge, in 22-53-35, about 5 miles south of the Champion, where drill borings had located an amygdaloid, apparently the Baltic lode, which carried a little copper. Sinking was begun Sept. 10, 1904. A drop shaft was sunk through the heavy overburden, but the permanent shaft will be an upraise on the angle of the lode. The drop shaft, after passing through 114' of drift, was bottomed in a 13' amygdaloid showing considerable copper, which is sup-

posed to be the twin amygdaloid of the Baltic lode, as found at the Baltic, Trimountain and Champion mines, to the northward. What is supposed to be the Baltic bed is 90' distant and will be reached by a crosscut. The company will spend \$3,000 to \$4,000 monthly on the Challenge, during 1905, unless an exceptionally rich showing should warrant putting on more pressure.

ST. MICHAELS MINING, MILLING & REFINING CO. NEW MEXICO.

Mine office: Tres Piedras, Taos Co., N. M. A. York, superintendent.

ST. PAUL MINE.

COLORADO.

Mine office: Red Mountain, Ouray Co., Colo. T. Braden, owner; J. I. Sweet, superintendent. Ores carry silver, lead and copper. Has steam power.

ST. REGIS COPPER MINING & MILLING CO.

MONTANA.

Mine office: St. Regis, Missoula Co., Mont. Fred W. Wilson, superintendent. Ores carry copper and gold. Has steam power.

SALIDA GOLD & COPPER MINING CO.

COLORADO.

Mine office: Salida, Chaffee Co., Colo. Capitalization \$100,000, shares \$1 par. E. B. Green, manager; Francis Shine, secretary. Property is the Salida mine, leased for 10 years from the Sedalia Copper Co., on 15% royalty. The Salida company has built a large concentrator and leaching plant, 76x119' and 4 stories high. Ore is received by gravity-tram from mine, 2 miles distant. Mine has very large deposits of very low-grade ore.

SALIDO GOLD-COPPER CO.

MEXICO.

Office: 823 H. W. Helmann Bldg., Los Angeles, Cal. Dr. Finis E. Yoakum, president and general manager; N. N. Dietz, secretary. Lands, 30 pertenencias, in the Alamos district of Sonora, said to show a 60' vein. Stock of the company is insured and guaranteed, which is the only thing known against the corporation.

SALISBURY COPPER CO.

NORTH CAROLINA.

Office: Salisbury, N. C. Organized 1903, under laws of Arizona, with capitalization \$100,000, by W. S. Blackmer, et al. Said to be opening a 15' vein showing good copper ores.

SALMON RIVER MINING CO.

NEVADA.

Mine office: Contact, Elko Co., Nev. Moses Jones, superintendent. Ores carry gold, silver and copper. Has gasoline power and small smelter.

SALT LAKE COPPER CO.

Letter returned unclaimed from former office in Salt Lake City, Utah.

COMPANIA MINERA DE SALTILLO.

MEXICO.

Office: 9A de Hidalgo, Saltillo, Coahuila, Mex. Mine office: Concepcion del Oro, Zacatecas, Mex. Antonio Rodriguez, president; Angel Rios, manager. Operates the Jesus Nazareno mine, producing gold, silver, lead and copper. Has steam power and employed 200 men at last accounts.

SAMPSON GROUP.

BRITISH COLUMBIA.

Promising sulphide outcrops at Beasley, 7 miles west of Nelson, B. C.

SAMSON MINE.

UTAH.

Sold in March, 1903, to Bingham Copper & Gold Mining Co.

COMPañA MINERA DE SAN ACASIO y ANEXAS.**MEXICO.**

Mine office: San Jose de Guadalupe, Durango, Mex. Is a producer of iron ore, copper and gold, employing about 100 men.

SAN BALTAZAR COPPER CO.**MEXICO.**

Office: 508 Germania Bank Bldg., Pittsburg, Pa. Mine office: Tlacolula, Oaxaca, Mex. Employs 150 men. Organized December, 1904, under laws of Maine with capitalization \$1,000,000, shares \$10 par, issued \$780,000. J. Albert McKay, president; Hon. Pembroke R. Flitcraft, vice-president; Oscar A. Rogers, secretary; Andrew B. Berger, treasurer; Guillermo W. Thompson, general manager; Frank M. Lehmer, superintendent. Lands sundry groups, area 700 acres, also 40-acre millsite, in the Guelavila and Tlacolula districts, 8 miles south of the ruins of Mitla. Country rocks are porphyry and limestone, carrying numerous contact veins or lenses, of which 6 are being developed, these having an average width of 8' and outcropping for 2 miles. Development has but fairly begun, only shaft being but 50' deep on March 8, 1905, but showing selected oxide and carbonate ores of 44% copper tenor, while assays of outcrops give 1% to 15% copper, 15 oz. to 20 oz. silver and from nothing to 16% lead. It is planned to develop mainly by tunnels. Management is good and property considered promising.

COMPañA MINERA DE SAN ANTONIO.**MEXICO.**

Mine office: La Cruz, Tamaulipas, Mex. Alex. Dozal, manager. Ores carry copper, lead and silver. Employed about 50 men at last accounts.

SAN BARTOLO COPPER MINES, LTD.**CHILE.**

Liquidated voluntarily. Lands were near Antofagasta, Chile.

SAN BERNARDINO COPPER CO.**CALIFORNIA.**

Organized March 8, 1899, under laws of West Virginia, with capitalization \$2,500,000, \$500 paid in, by J. B. Neily, et al, of Boston. Lands said to be 360 acres, somewhere in California.

SAN CALLETANO MINING & SMELTING CO.**ARIZONA.**

Office: care of Reddin Inv. Co., 121 Geary St., San Francisco, Cal. Capitalization \$1,000,000, shares \$1 par. Lands, 12 claims, in Santa Cruz county, Arizona.

SAN CARLOS COPPER CO.**ARIZONA.**

Lands are under bond to the Saddle Mountain Mining Co.

SAN CARLOS COPPER CO.**MEXICO.**

Office: 25 Broad St., New York. Mine office: Linares, Nuevo León, Mex. Employs about 800 men. Organized 1896, under laws of New York, with capitalization \$100,000, shares \$1 par. W. H. Nichols, Jr., president; S. H. Steele, secretary and treasurer; Edw. D. Self, general manager. Mining lands are 6 square miles, in the San Carlos district of Tamaulipas, Mexico, with smelter at San José, Tamaulipas, also 6,400 acres of timber lands. Veins are contacts between limestone and porphyry, and ores are oxides, carbonates and sulphides, mainly the latter. Development is by upwards of 50 shafts and about 7 miles of tunnels, with total underground openings of about 10 miles. Nearest railroad is the Gulf branch of the Mexican Central, 38

miles distant. Company has brought suit against Melville & Kelly, of Saltillo, for failure to build a branch railroad to the mines, as agreed, but such line is to be constructed. Production of refined copper is officially reported by the Mexican government as 88,184 lbs., which is very much under the usual estimates.

SAN CRISTOBAL COPPER CO.

NEW MEXICO.

Office: 616-116 Broad St., New York. Mine office: Arroyo Seco, Taos Co., N. M. Richard Hopkins, president; B. F. Shakespeare, secretary; J. K. Turner, manager. Lands, 1,850 acres, also sundry water-rights and a railroad franchise. Has an 80' ore body, carrying copper, gold, silver and lead, opened by a 1,000' tunnel. Has a smelter and cyanide plant, and plans building a 150-ton concentrator. Original development was for copper, but present operations are confined almost exclusively to a big ledge of gold-bearing quartz.

SAN DOMINGO GOLD & COPPER CO.

ARIZONA.

Absorbed by Picacho Blanco Mining Co.

MINA SAN DOMINGOS.

PORTUGAL.

Owned and operated by Mason & Barry, Ltd.

SAN FERNANDO COPPER MINING & SMELTING CO.

MEXICO.

Office: care of Woods Investment Co., Colorado Springs, Colo. Mine office: Ensenada, Baja California, Mex. Organized 1894, under laws of Colorado, with capitalization \$1,000,000, shares \$1 par. F. M. Woods, president; H. E. Woods, vice-president; Warren Woods, treasurer; John V. Smale, general manager. Lands, 80 pertenencias, showing 8 veins of 2' to 6' width, carrying oxide, carbonate and sulphide ores averaging 6% copper, with small values in gold and silver.

MINA SAN FRANCISCO.

PERU.

Owned and operated by Compañia Minera Santa Ines y Morococha.

MINAS DE SAN FRANCISCO y OTRAS.

MEXICO.

Mine office: care of G. V. Monteverde y Ca., owners, Pesqueria, Sonora, Mex. Ores carry gold, silver, lead and copper.

NEGOCIACION MINERA SAN FRANCISCO y ANEXAS.

MEXICO.

Mine office: Mineral de Asientos, Aguascalientes, Mexico.

COMPANIA MINERA DE FRANCISCO DEL AZUL.

MEXICO.

Mine office: Matehuala, San Luis, Potosí, Mexico.

SAN FRANCISCO DEL ORO MINES, LTD.

MEXICO.

Offices: 65, London Wall, London, E. C., Eng. Mine office: Parral, Chihuahua, Mex. Organized April 18, 1903, with capitalization £375,000, shares £1 par; issued, £310,000. Earl of Denbigh, chairman; Rowland C. Fielding, consulting engineer; James Hyslop, mine manager; J. F. McNab, secretary. Lands, 253 acres, carrying gold, silver, copper, lead and zinc ores, undergoing development. Shipments are made to nearby smelters, and profits earned in first 18 months are given by company as in excess of £22,000.

FINCA SAN JOAQUIN.

CUBA.

An old mine, about 30 miles northeast of Cienfuegos, Cuba, worked

intermittently, 1856-1885, ores having been shipped to Swansea and the United States for smelting, and returning an average of nearly 20% copper. Vein ranges up to 30' in width, carrying azurite, melaconite, cuprite, bornite and chalcopyrite.

SAN JOSE CONSOLIDATED MINING CO.**MEXICO.**

Mine office: Nocoziari, Moctezuma, Sonora, Mex. Organized under laws of Arizona and protocolized in Mexico. Lands, circa 100 acres, not far from the Moctezuma Copper Co., showing a vein of 5' to 12' width, carrying values mainly in silver, and lead, with some gold and copper.

SAN JOSE MINE.**CHILE.**

Mine office: care of Silva y Rivas, owners, Tamaya, Ovalle, Chile. Mine was opened in 1844 and is 517' deep.

MINAS SAN JOSE, SAN MIGUEL y EL BRUJO.**SAN SALVADOR.**

Office and mines: care of Luna Hermanos, owners and managers, Metapán, San Salvador, Central America. Ores carry copper, gold and silver. Have steam power and smelter and employ about 250 men.

SAN JUAN GROUP.**CHILE.**

Mine office: Copiapó, Atacama, Chile. Sr. Tomás Marambio, owner. Deepest shaft, about 1,800'. Originally worked for silver, but copper values predominate at depth.

MINA SAN JUAN.**SPAIN.**

Mine office: Paimogo, Huelva, Spain, Don José De Soto, manager. Lands, 102 hectares, including 4 old mines.

SAN JUAN MINING CO.**COLORADO.**

Mine office: Central City, Gilpin Co., Colo. J. I. Perkins, manager. Ores carry gold, silver and copper. Has steam power.

SAN JUAN SMELTING & REFINING CO.**COLORADO.**

Mine and works office: Silverton, San Juan Co., Colo. Employs about 200 men. Geo. Oliver, president; W. F. Kendrick, vice-president; F. C. Kendrick, general manager. Organized, 1903, with capitalization \$3,000,000, as a consolidation of the Kendrick & Gelder Smelting Co., Oliver Reduction Co. and Paradox Copper-Gold Mining Co. Principal mining property is the Henrietta, carrying ores of gold, silver and copper, the milling ore averaging about 3.5% copper and the smelting ore about 7% copper, with occasional chutes of high grade ores running up to 20% and even 30% copper. Mine said to have ore reserves of 350,000 tons in sight. Mine has gasoline and electric power. Reduction plant includes a 400-ton concentrator and 200-ton smelter.

MINA SAN JUAN DE MALAJA.**CUBA.**

A promising prospect, with 100' gossan capping, about 6 miles northeast of Santa Clara, Cuba.

MINAS SAN LORENZO y ALLENDE.**MEXICO.**

The San Lorenzo and Allende mines, area 36 pertenencias, or about 90 acres, in the Ures district, Sonora, Mexico, bought by Frederick A. Platt, et al, in 1902, are undergoing development. The San Lorenzo has a 4' vein

assaying as high as 18% copper and 30 oz. silver per ton. The Allende is not so rich, but is said to be a promising property.

COMPANÍA MINERA SAN LUIS.

MEXICO.

. At Tepezalá, Aguascalientes, Mex. \Sold to Aguascalientes Metal Co.

SAN LUIS MINING CO.

MEXICO.

Office: 27 William St., New York. Mine office: Gabriel, Durango, Mex. Employs 800 men. Organized 1900; under laws of West Virginia, with capitalization \$2,250,000, shares \$10 par. Walter S. Logan, president; Myra B. Martin, secretary; Geo. A. Treadwell, treasurer; Louis Ross, managing director; Henry E. O'Driscoll, mine superintendent; Sidney E. Tyler, mill superintendent; Lloyd Robey, engineer. Mining lands, 867 acres, also 10-acre smelter-site and sundry timber lands, etc., giving total holdings of 46,160 acres, in the Panuco de Coronado and San Lucas districts of Durango, showing about 60 fissure and contact veins, of which 5 are being developed, these having average widths of 20', reported by company to carry an average of 8% copper, 15% lead, 25% zinc, 20 oz. to 1,000 oz. silver and \$8 gold per ton, from oxide, carbonate and sulphide ores. The San Luis has a 400' shaft and tunnels of 250' and 350'; the Potosina No. 1 has shafts of 250' and 400', the San Lucas has 2 shafts of 150' each and tunnels of 1,200' and 300'. Total underground openings are about 5 miles, estimated to show 150,000 tons of ore blocked out for stoping. These are very old mines, reopened in 1901 by the present company. Has steam power, mines using 600 h. p. and mill 200 h. p. Equipment includes 2 Ingersoll air-compressors and 10 power drills. Buildings include a 20x60' stone machine shop, 20x80' wood carpenter shop, smithy and 60 dwellings. All high-grade ore is shipped to the Monterey and Aguascalientes plants of the American Smelting & Refining Co., over nearest railroad, the Mexican International, 12 miles distant. Fuel is wood, costing \$6 per cord, and soft coal costing \$15 per ton. Considerable production has been secured since present company took charge. Property is regarded as valuable, and seems to be well handled. Mr. Ross reports that since he took charge in February, 1902, debts aggregating \$400,000 have been discharged and a net profit of \$250,000 earned.

COMPANÍA BENEFICIADORA SAN LUIS.

MEXICO.

Works office: San Luis de la Paz, Guanajuato, Mex. The smelter is known as the Ojo de Agua. Production in 1903 was 29,054 lbs. fine copper.

SAN MARCEL MINE.

ITALY.

An old mine, of limited production, in Piedmont, Italy.

SAN MARCIAL GROUP.

MEXICO.

Office and mine: care of Gus Peterson, owner and manager, Rosario, Sinaloa, Mex. Ores carry silver, lead, gold and copper.

SAN MIGUEL COPPER CO.

NEW MEXICO.

Lands are in the Tecolote district of San Miguel county, New Mexico. Management said to contemplate installing a 150-ton leaching plant.

SAN MIGUEL COPPER MINES, LTD.

SPAIN.

Offices: 3, Church Court, Old Jewry, London, E. C., Eng. Mine office

Almonaster la Real, Huelva, Spain. Organized Oct. 12, 1904, with capitalization £150,000, shares £1 par; issued, £100,000. Debentures, £75,000 at 6%, in 3 bonds of £25,000 each, redeemable Nov. 1, 1905, 1906 and 1907. A. C. Eberbach, managing director; F. O. Harvey, consulting engineer; G. Emdin, secretary. Lands, 1,900 acres, including the San Miguel mine carrying cupriferaous iron pyrites, and sundry adjoining properties, also a 19-kilometre branch railway line from Almonaster la Real to El Cerro, on the Zafra & Huelva railway. Ore reserves are estimated at 428,000 tons, in addition to which there are about 300,000 tons in teleras and tereros, on surface. Property was worked for some years by a Portugese company, until taken over by present owners in 1904, and made 789 long tons of copper in 1899. Property is one of large size and undoubted value, and present company has earned very substantial profits from its inception, and should pay a good dividend in 1905.

SOCIEDAD MINEIRA DE SAN MIGUEL DE HUELVA. PORTUGAL.

Succeeded, October, 1904, by San Miguel Copper Mines, Ltd.

COMPANIA MINERA DE SAN MIGUELITO. MEXICO.

Mine office: Cumpas, Moctezuma, Sonora, Mexico.

SAN PEDRO COPPER CO. NEW MEXICO.

Mine office: San Pedro, Santa Fé Co., N. M. Idle.

MINA SAN PEDRO. ARGENTINA.

A small mine in the Mexicana district of Rioja, Argentina. Highest grade shipping ore assays up to 30% copper, 30 oz. silver and 0.5 oz. gold per ton.

MINA SAN PEDRO. MEXICO.

Mine office: Cedral, San Luis Potosí, Mex. Owned by J. A. Arbide and Roberto Yrizar.

SOCIETE ANONYME DES MINES DE SAN PEDRO. SPAIN.

Offices: Rue de Chateaudun, 39, Paris, France. Mine office: Zalamea La Real, Huelva, Spain. Capitalization, 450,000 francs. Don Carlos Marchal, agent. Lands include the Barranco de los Buyes group of 10 old mines, area 167 hectares.

COMPANIA MINERA DE SAN PEDRO DE NOLASCO. CHILE.

Mine office: San Pedro de Nolasco, Victoria, Chile. Owns the Carlotta mine, opened 1795, and developed by a 700' tunnel.

MINA SAN PIO. MEXICO.

Office: care of Spencer C. Richardson, owner, 40 Water St., Boston, Mass. Is located 12 hours horseback ride southwest of Ameca, Jalisco, Mex.

MINA SAN PLATON. SPAIN.

Office: care of Don Antonio Ruiz Cancela, Sevilla, Spain. Mine office: Almonaster, Huelva, Spain. Lands, 46 hectares. Idle.

SAN REMO COPPER CO. ARIZONA.

A spectral corporation, organized under the laws of West Virginia, as the astral body of the Copper Belle Mining Co., with capitalization \$300,000—later increased to \$2,000,000, without the knowledge or consent of the share-

holders—which once had, or was supposed to have, to the best recollection of the surviving shareholders, some sort of a claim to three claims of some sort, in the Dragoon Mountains, Cochise county, Arizona.

MINA DE SAN TELMO.

SPAIN.

Owned and operated by Sociedad Colectiva Ibarra Hnos.

SAN TORINA MINES.

GREECE.

Mine office: San Torina, Greece. Owned by an Austrian company, of Trieste. Ores are oxides and carbonates. Idle.

SAN TOY MINING CO.

MEXICO.

Office: 1314 Wells Bldg., Milwaukee, Wis. Mine office: Santa Eulalia, Chihuahua, Mex. Organized under laws of Maine, with capitalization \$2,500,000, shares \$1 par. Sylvester T. Everett, president; Josiah Quincy, vice-president; A. S. Witherbee secretary and treasurer. Lands, 5 groups of claims, on which extensive development has been secured. Old mine openings aggregating nearly 10 miles. Company claims to have 200,000 tons of ore in sight that should give net returns of about \$8 per ton, mainly from silver, with small copper values.

SANTA BEATRIZ MINES.

MEXICO.

Mine office: care of Richard Pearce, superintendent, Magdalena, Sonora, Mex. Has steam power.

SANTA CECILIA COPPER MINING CO., LTD.

Wound up, July, 1901.

SANTA CRUZ COPPER CO.

MEXICO.

Supposed to have claims near Santa Cruz, Arizpe district, Sonora, Mexico.

SANTA CRUZ MINING CO.

ARIZONA.

Office: 368 Stock Yards, Kansas City, Mo. Mine office: Patagonia, Santa Cruz Co., Ariz. Employs 12 men. W. W. Hall, president; W. B. Barnes, vice-president; Geo. W. Bolen secretary and treasurer; Wm. M. Schwartz, general manager. Organized October 5, 1901, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Lands, 6 claims, area 124 acres, in the Harshaw district, showing several fissure veins of about 20' average width giving general average assay values of 8.5% copper, 20 oz. silver and \$25 gold per ton, mainly from chalcocite. Has shafts of 65' and 150', also several short tunnels. Mine was discovered 1860, opened 1890, reopened 1900. Has steam and gasoline power and is only 2½ miles from the Sonora branch of the Southern Pacific railway. Property gives indications of having a large ore body at a depth of about 300', and company plans developing this. Management good and property considered promising.

SANTA EMILIA COPPER CO.

MEXICO.

Office: 69 Wall St., New York, N. Y. Mine office: Coapa, Michoacan, Mex. Employs 60 to 75 men. A. J. Peyton, president and general manager; Geo. W. Lockwood, vice-president; Manuel L. Ward, secretary and treasurer; Joseph G. Collinson, superintendent; J. R. Crum, engineer. Organized Sept. 28, 1899, under laws of Delaware, with capitalization \$1,000,000, increased, 1904, to \$2,000,000, shares \$1 par. Lands, 83 acres, in the Tacam-

bara district. Principal development is by the Napoleon tunnel, about 1,200' long, and a 600' two-compartment shaft. Has good steam plant, and mine buildings with accommodations for about 100 workmen. Recent developments, at depth, have been quite encouraging.

SANTA EULALIA MINING & MILLING CO.**MEXICO.**

Office: 12 State St., Chicago, Ills. Mine office: Velardeña, Durango, Mex. Conrad Auw, president; Henry Grant, secretary; Wm. J. Auw, manager. Has a 325' main shaft and 220' tunnel, developing ores of lead, copper, gold and silver. Has gasoline power and plans installing electric plant and electric drills. Employs 100 to 125 men.

SANTA FE GOLD & COPPER MINING CO.**NEW MEXICO.**

Office: 11 Broadway, New York. Mine office: San Pedro, Santa Fé Co., N. M. Idle. Organized 1899, under laws of New Jersey, with capitalization \$2,500,000, shares \$10 par, as a reorganization of the original Santa Fé company, formed 1888 and bankrupt 1892. Present company began business with \$500,000 cash; balance of assets Jan. 1, 1905, was \$150,286.24. Annual meeting, fourth Tuesday in January. State Street Trust Co., Boston, registrar; Old Colony Trust Co., Boston, transfer agent. J. H. Susmann, president; E. H. Westlake, secretary and treasurer. Lands, 3,400 acres of mineral property and 46,000 acres of miscellaneous lands, including coal lands of considerable promise, in the old San Pedro land grant. Mine is opened by a single shaft, on a blanket vein of sulphide ore running 150' to 175' thick and dipping at an angle of less than 15°. About half the ore body is workable, though low in grade. Ore smelted in 1901 gave average returns of 4.75% copper, \$1.50 silver and \$1.50 gold per ton, slags showing about 0.5% copper only. It has been alleged that mining and smelting costs were about \$7 per ton of ore, but this figure undoubtedly is too low. Ore is silicious, requiring heavy iron and lime fluxes. The mine has ore reserves of about 30,000 tons blocked out. The smelter, with two 125-ton furnaces, was blown in Jan. 1, 1901, and blown out in the following November. The mine and smelter are 21 miles from the Santa Fé Central Railroad, with a connecting line surveyed, but not built. Much trouble was experienced when the smelter was in blast from shortage of coke supply and inadequate transportation facilities. To operate the property to advantage, ore should be concentrated, to obviate the smelting of an immense amount of barren material in both ore and fluxes, and proper railroad connections are imperatively demanded for profitable operations. The only work done since 1902 has been the boring of 543' of diamond drill holes. The property is a promising one, and probably would prove profitable if given a concentrator and railroad connection, and worked on a moderately large scale with careful management—as careful and brilliant a management as practically the same owners are giving the Tennessee should render the Santa Fé a success.

SANTA FE GOLD & COPPER MINING CO.**MEXICO.**

Mine office: Alamos, Sonora, Mex. Cyrus F. Tolman, manager. Stock is controlled by International Copper & Gold Co.

SANTA FE MINING & REDUCTION CO.**NEW MEXICO.**

Said to have been organized by Chicago capitalists to operate in the Santa Fé district, but letter returned unclaimed from Santa Fé, N. M.

COMPANIA SANTA INES y MOROCOCHA.**PERU.**

Office: Calle de Aparicio No. 19, Lima, Perú. Mine office: Morococha, Junin, Perú. Employs 120 men. Organized under laws of Perú, with capitalization 1,200,000 sols. Roberto Pflucker, president; Leopoldo Pflucker, vice-president; Porfirio Silva, secretary; Vicente Pazos y Sacio, general manager. Lands, 120 mining claims, area 240 hectares, also the Hacienda Morococha, area 56 square kilometres. Mining lands carry sundry fissures in and contact veins between diorite and limestone, these averaging about one metre in width and carrying values up to 25% copper, with average returns of about 16% copper and 16 oz. silver per ton, from sulpho-arsenide ores of copper. The mines are opened by the Ausiliar tunnel of 300 metres, Media Falda tunnel of 600 metres and La Laguna tunnel of about 800 metres length, with a total of about 3,000 metres of underground openings, estimated to show about 50,000 tons of ore with 25,000 tons blocked out for stoping. Mine is operated by electricity, furnished by a 40-kw. Siemens & Halske generator, with 3 electric drills, and is served by the Ferrocarril Central de Perú, tracks of which touch the mine.

Country coal, costing about \$9 per ton, is used for fuel, and cost of mining is given by company as averaging about \$2.50 per ton. Product is dressed to an average copper tenor of about 25% and shipped to Europe for smelting, freight averaging about \$10 per ton. Production for 1904 was about 3,000 long tons, carrying about 1,675,000 lbs. fine copper. It is planned to erect a 100-ton smelter. Company is well managed and property is one of much merit.

SANTA ISABEL MINING & MILLING CO.**COLORADO.**

Office: Colorado Springs, Colo. Mine office: Creston, Saguache Co., Colo. L. N. Fitts, superintendent. Ores carry gold, silver and copper. Has steam power and 100-ton concentrator.

MINA SANTA MARIA.**HONDURAS.**

An undeveloped property at Comayagua, Honduras, asserted to be a mountain of ore ten miles in circumference, assaying 10% of 75% copper. Assertion not vouched for.

COMPANIA MINERA SANTA MARIA DE LA PAZ.**MEXICO.**

Office: 10 Cinco de Mayo, San Luis Potosí, S. L. P., Mex. Mine office: Matehuala, S. L. P., Mex. Pedro Barrenchea, president; Rafael G. Barrenchia, secretary; W. B. A. Dingwall, manager; José Torres, superintendent. Has mines extensively developed, carrying ores of lead, copper, silver and gold, fully equipped with steam, electric and gas power, Chilean mills, Blake crushers, smelter with two 40-ton furnaces, and is completing a new 300-ton concentrator. Employs 1,500 to 2,000 men, and is a considerable producer.

SANTA RITA COPPER MINING & SMELTING CO.**ARIZONA.**

Office: Chemical Bldg., St. Louis, Mo. Mine office: care of L. Zeckendorf

& Co., Tucson, Pima Co., Ariz. Employs 15 to 20 men. Organized June, 1901, under laws of Arizona, with capitalization \$3,000,000, shares \$1 par. Has changed officers repeatedly since organization. At last accounts C. F. Elliott, of El Paso, was secretary, and Jos. P. Steele, superintendent. Lands, 40 claims, area 630 acres, also 4 timber claims and a 20-acre smelter site, in the Tindell district, Santa Rita Mountains, 38 miles south of Tucson, with country rock of granite-porphry, showing 10 veins, of which 4 are being developed, these averaging 8' to 30' width and giving average assays of about 18% copper, 6% to 12% lead, 1% to 3% zinc, 40 oz. to 68 oz. silver and \$2 to \$8 gold per ton, from sulphide ores, developed by 5 shafts of 20' to 110' in depth, and 5 tunnels of 40' to 260' length, with about 1,000' of underground openings. Property lacks rail connections. Company said to plan building a 100-ton concentrator.

SANTA RITA MINING CO.**NEW MEXICO.**

Office: 85 Ames Bldg., Boston, Mass. Mine office: Santa Rita, Grant Co., N. M. Capitalization \$5,000,000, shares \$25 par. Company said to contemplate reduction of capitalization to \$2,000,000. Albert C. Burrage, president; B. B. Thayer, superintendent. Paid a dividend of 50 cents per share, amounting to \$100,000, in 1904.

Lands, 79 claims, 46 patented, area about one square mile, near Santa Rita. Is the oldest copper mine in New Mexico, and one of the oldest in the United States, having been opened A. D. 1800. The mine was abandoned, circa 1820, owing to the Mexican revolution, and was reopened, circa 1860. The company employs about 75 men, in addition to which much of the mine is leased. Mine is shallow, ores being mainly oxides and carbonates. Has a 180-ton concentrator, equipped with rolls and Wilfley tables. Company is exceedingly secretive and gives out no information whatever, for reasons best known to the management. Production for 1904 is estimated at 6,000,000 lbs. fine copper.

SANTA ROSA COPPER CO.**ARIZONA.**

Office: Clifton, Ariz. Mine office: Metcalf, Graham Co., Ariz. Capitalization \$500,000. Joseph A. Tanner, president and manager; L. S. Randolph, secretary. Property is slightly developed and is considered one of promise.

SANTA ROSA DEVELOPMENT CO.**SONORA MEXICO.**

Office: Douglas, Ariz. Mine office: Santa Rosa, Sonora, Mex. Employs about 25 men. Organized September, 1903, under laws of Arizona, with capitalization \$100,000, shares \$10 par. Chas. A. Overlock, president; D. E. Heller, vice-president; Thos. A. Rendle, secretary and general manager. Lands, 136 pertenencias, in the Arizpe district, about 15 miles south of Douglas and 3½ miles from the Nacozari railroad, showing three contact veins between porphyry and limestone, developed by 5 shafts and 5 tunnels. Ores carry good values in copper, lead and silver, with small gold values, assays having been secured up to 37% copper, 35% lead and 20 oz. silver per ton. Has a 25-h. p. gasoline hoist and 50-h. p. gasoline air-compressor. Management considered good and property promising.

SANTA ROSA DE MAZAPIL MINING CO.**MEXICO.**

Office: 20 Broad St., New York. Mine office: Mazapil, Zacatecas, Mex. Has gold, silver, lead and copper ores, developed by a 1,500' tunnel and sundry shafts. Employs a considerable force.

MINA SANTIAGO.**MEXICO.**

Letter returned unclaimed from Fuerte, Sinaloa, Mexico.

SANTO NIÑO MINING CO.**MEXICO.**

Letter returned unclaimed from former office, Monterey, Nuevo León, Mex. Mine office: Symon, Durango, Mex. John Ross, superintendent. Property is El Carmen mine, carrying ores of gold, silver and copper.

SAPHO MINING CO.**NEVADA.**

Mine office: Ely, White Pine Co., Nev. C. P. Webber, manager. Has auriferous oxidized ores, assaying 6% to 22% copper, with pay-streak running about \$30 gold per ton. Has steam power. Was developing at last accounts.

SARATOGA PYRITIC SMELTING CO.**COLORADO.**

Office: 204 California Bldg., Denver, Colo. Mine office: Ironton, Ouray Co., Colo. Ores carry gold, silver, lead and copper. Has steam power.

SASAGATINI MINE.**JAPAN.**

Mine office: Hatazako-mura, Kanoashi-gori, Iwami, Japan. Has slightly argentiferous chalcopyrite, associated with sphalerite, galena and arsenopyrite, with quartz and limestone gangue, in numerous contact veins ranging up to 50' in width. Production in 1900 was 62,961 momme of silver and 274,412 lbs. fine copper.

SATER COPPER CO.**NEW MEXICO.**

Office: 1512 Farmers' Bank Bldg., Pittsburg, Pa. Mine office: Clayton, Union Co., N. M. Employs 6 men. Organized December 19, 1903, under laws of New Mexico, with capitalization \$2,500,000, shares \$1 par. Jared Sater president; C. L. Mohny, vice-president; Dr. W. W. Wolfe, treasurer, W. H. Staley, secretary; Geo. C. Carson, general manager. Lands, 20 claims, area 615 acres, also a 5-acre smelter site, in the Black Mesa district. Country rock is sandstone, showing 4 veins, said by company to average 25' width and to give assays of 18% copper, 7 oz. silver and \$2 gold per ton, from carbonates at surface and sulphides at depth, opened by a tunnel. A promised railroad was not built in 1904, but relief is hoped for during 1905. Company is undecided whether to erect a matting furnace or build a leaching plant. Company is paying its way as it goes, and developments secured at the mine during 1904 were decidedly encouraging.

SAUK RIVER MINING CO.**WASHINGTON.**

Office: 327 Pacific Blk., Seattle, Wash. Mine office: Darrington, Snohomish Co., Wash. Organized 1898, under laws of Washington, with capitalization \$200,000, shares 50 cents par. Harold G. Price, president and treasurer; Wm. Van Waters, secretary. Lands, 9 claims, in 3 groups, area 180 acres, carrying 3 veins of auriferous and argentiferous copper ore. Vein at Blue Bird group is said to be 98' wide, between porphyry and slate, carrying 3 pay-streaks, of 2', 4' and 6', balance of vein being a low-grade self-fluxing concentrating ore.

SAULT GRAY COPPER CO.**ONTARIO.**

Absorbed by Copper Queen Mining Co. (of Ontario).

SAULT PROSPECTING & DEVELOPMENT CO.**ONTARIO.**

Office: Sault Ste. Marie, Mich. R. N. Adams, secretary. Idle. Lands, about 25 miles north of the Bruce mines, in Concessions 4 and 5, Morin Twp., Algoma, Ontario, carrying a quartz vein showing chalcopyrite.

SAUX HEAD COPPER MINING CO., LTD.**MICHIGAN.**

Office: 29 Home Bank Bldg., Detroit, Mich. Mine office: Marquette, Marquette Co., Mich. Organized August 13, 1902, under laws of Michigan, with capitalization \$2,500,000, shares \$1 par. Chas. A. Stringer, president and general manager; Frank M. Moore, vice-president; John G. Kreig, secretary; Frank E. Kreig, superintendent; Chas. H. Kreig, clerk. Lands, 200 acres, owned in fee, in the Sauk's Head district, northwest of Marquette, showing two ore bodies, said by company to occur as impregnations in granite and diorite, opened by a 115' shaft and 3 short tunnels, giving assays of 1% to 2% copper, 1 oz. to 5 oz. silver and \$4 to \$195 gold per ton, from chalcopyrite. Has steam power and a 5-drill air-compressor, with necessary mine buildings. Nearest railroad, 12 miles. Idle.

SAVANIC MINE.**ARIZONA.**

A partly developed mine in the northern part of Mohave county, Arizona, nearest town being St. George, Utah. Has shipped 14 carloads of copper ore to Salt Lake smelters, averaging 39% copper, this being hauled 140 miles by wagon and 300 by rail. Erection of small smelter on banks of Virgin river said to be contemplated. Property unquestionably is of great richness and promise, but is almost inaccessible at present.

SAVAGE GOLD & COPPER CO.**ARIZONA.**

Office: Douglas, Ariz. Mine office: Paradise, Cochise Co., Ariz. Employs 25 men. Organized 1904, under laws of Arizona, with capitalization \$3,000,000, shares \$1 par. W. H. Pratt, president; J. A. Lewandowski, vice-president and general manager; A. P. Behnke, treasurer and purchasing agent; E. Lewandowski, secretary; James Reay, mine superintendent. Lands, 43 claims, area 875 acres, in the California mining district, at the eastern end of the developed field of the Chiricahua Mountains, carrying 5 irregular ore bodies, one, of 20' width, opened by shafts of 150' and 200', and a 300' tunnel, with a total of about 1,200' of underground openings, showing a considerable amount of oxide and carbonate ore giving assays of 5% to 15% copper and up to 300 oz. silver per ton, with occasional lead values from galena.

Company reports that a 50-ton smelter, building at the mine, will be blown in May, 1905, and that it is hoped to pay a dividend 6 months later.

SAVAGE GOLD & COPPER COLORADO, NEW MEXICO & WYOMING. MINING CO.

Office: Cripple Creek, Colo. Capitalization, \$1,500,000, shares \$1 par. Lands, 4 fractional gold claims, area 12 acres, in the Cripple Creek district, Teller county, Colorado; sundry claims in the Santa Rita district, Grant county, New Mexico, and claims in the Battle Lake district, Carbon county, Wyoming. Cripple Creek property is under lease to T. H. Thomas, and the

copper properties in New Mexico and Wyoming are idle. Management prefers waiting to going in debt. The Wyoming copper properties are considered well located.

SAWATARI MINE.**JAPAN.**

Owned and operated by the Mitsu Bishi Gosshi Kwaisha.

SAYLER MINE.**CALIFORNIA.**

Office and mine: care of N. N. Sayler, owner, Garlock, Kern Co., Cal.

SCANTIC GOLD MINING & MILLING CO. COLORADO & MEXICO.

Office: 206 Continental Bldg., St. Louis, Mo. Mine offices: White Cross, Col., and Charcas, San Luis Potosí, Mex. John H. Hammond, Denver, president and general manager; W. F. Smith, superintendent of Colorado property, which has steam power, and is developing ores of gold, silver, copper and lead, with a force of 25 men. Joseph T. Murphy, manager of Mexican property, which includes the San Sebastian and extensions, carrying silver, lead and copper, equipped with a 25-ton concentrator and employing about 100 men.

KUPFERKIESBERGBAU SCHATTEBERG.**AUSTRIA.**

Mine office: Schatteberg, Tyrol, Austria. A small producer only.

GEWERKSCHAFT SCHLESISCHE NICKELWERKE.**GERMANY.**

Mine office: Gläsendorf, Schlesien, Germany. Employs 300 men. Lucien Pierron, president; W. Woltman, smelter superintendent. Lands include 7 properties, developed by shallow shafts, producing about 60 tons daily of cupriferous nickel ore.

SCHUYLKILL COPPER CO.**ARIZONA.**

Mine office: Chloride, Mohave Co., Arizona.

SCOTIA MINING & MILLING CO.**WASHINGTON.**

Office: Spokane, Wash. Mine office: Bossburg, Stevens Co., Wash. Chas. E. Hoffman, superintendent. Ores carry gold, silver and copper.

SCOTTISH CHIEF MINE.**UTAH.**

Mine office: Park City, Summit Co., Utah. W. L. Lawrence, manager. Main shaft, 325'. Ore values are mainly silver and lead, with 1% to 7% copper and 40c to \$1.50 gold per ton.

SCOTTISH COPPER MINES SYNDICATE**BRITISH COLUMBIA.****OF BRITISH COLUMBIA.**

Offices: 26, Frederick St., Edinburgh, Scotland. Mine office: Kamloops, B. C. F. J. Norie, secretary; Henry Croft, manager, Victoria, B. C. Capitalization £25,000. Idle at last accounts.

SCOTTISH-AUSTRALIAN COPPER CORPORATION, LTD.

Registered, Jan. 16, 1904, in Guernsey, with capitalization £200,000, shares £1 par. Location of office or lands not learned. Guernsey is to Great Britain what New Jersey is to the United States—a breeding place for corporations that shun publicity.

SCOTTISH-AUSTRALIAN MINING CO., LTD.**AUSTRALIA.**

Offices: Winchester House, London, E. C., Eng. Organized Jan. 6, 1859, with capitalization £250,000, shares £1 par. G. T. Rait, chairman; F. W. Turner, secretary; H. F. Chilcott, mine manager in Australia. An old

and successful company, paying dividends of 2% to 10% annually. Works two collieries at Newcastle, N. S. W., and has mineral lands carrying coal and copper, at Rockhampton, Queensland.

SCOTTISH-CAUCASIAN COPPER SYNDICATE, LTD.

Offices: 55, West Regent St., Glasgow, Scotland. Registered May 30, 1902, with capitalization £2,000, shares £1 par.

SEABOARD COPPER CO.

VIRGINIA.

Office: 713-131 State St., Boston, Mass. Mine office: Virgilina, Halifax Co., Va. M. A. Packard, president; Edw. L. Pond, secretary; Albert W. Tucker, superintendent; Lee McCarn, mine superintendent. Organized July, 1902, under laws of New York, with capitalization \$300,000, shares \$1 par. Lands, 135 acres, including the Dorothy and Bailey mines, also 75 acres of timber lands, in the Virgilina district, 3 miles from the Southern Railway, showing three 8' fissure veins in slate, giving average assays of 4% copper, 6.4 oz. silver and 80c. gold per ton, from cuprite, malachite and azurite above, and bornite and chalcocite below. Has 3 shafts, deepest 260', and 2 tunnels, longest 200', with 745' of underground openings. Has steam power and 50-ton concentrator.

SEAGER-CORYELL GOLD & SILVER MINING CO., LTD.

IDAHO.

Office: Phillipsburg, N. J. Mine office: Custer, Custer Co., Idaho. Organized January, 1900, under laws of New Jersey, with capitalization \$100,000, shares \$1 par. John Eilenberg, president; Reginald Coryell, secretary and general manager. Lands 9 claims, area 170 acres, in the Yankee Fork district, showing several veins, with about 1,500' of underground development, one claim showing azurite, malachite, malaconite and chalcopyrite assaying 3% copper, with fair gold and silver values.

SEAL BAY MINE.

NEWFOUNDLAND.

An old property in Newfoundland. Deepest workings, 120'.

SEARCHLIGHT COPPER-GOLD MINING CO.

NEVADA.

Office: 250 Wilcox Bldg., Los Angeles, Cal. Mine office: Searchlight, Lincoln Co., Nev. J. W. Calkins, president; J. J. Lonergan, secretary; Chas. Van Ina, manager. Said to have a vein 5' to 7' wide and 4,000' long, assaying 10% copper and \$20 and upwards in gold per ton. A carload of ore shipped to Los Angeles, in 1902, gave returns of better than \$50 gold per ton.

SEATON MINING & MILLING CO.

COLORADO.

Mine office: Idaho Springs, Clear Creek Co., Colo. F. S. Goldsmith, superintendent. Ores carry gold, silver, lead and copper. Has steam power.

SEATTLE GOLD & COPPER MINING CO.

Office: care of A. E. Ripley, Seattle, Wash. Location of lands unknown.

SEDALIA COPPER CO.

COLORADO.

Lands leased for 10 years to the Salida Gold & Copper Mining Co.

SELBY SMELTING & LEAD CO.

CALIFORNIA.

Office: 416 Montgomery St., San Francisco, Cal. Works office: Selby, Contra Costa Co., Cal. A. J. Ralston, president; H. B. Underhill, Jr., secretary; Alfred Von der Ropp, superintendent; John Chase, purchasing agent.

Has an extensive smelting and refining plant, with steam and electric power, and employs about 250 men, drawing ore supplies from all of the Pacific states.

SELKIRK MOTHER-LODE COPPER MINES, LTD. BRITISH COLUMBIA.

Letter returned unclaimed from former office, 5, Laurence Pountney Hill, London, E. C., Eng.

SEMINOLE MINE.

GEORGIA.

Mine office: Washington, Wilkes Co., Ga. Carl Henrich, owner. Lands, 901 acres, well timbered with pine, cedar and hardwood, including the old Magruder mine. Before building a smelter, former owners shipped ores to the Balbach smelter at Newark, N. J., securing returns therefrom of 7.3% copper, 32% lead, \$8.40 silver and \$4 gold per ton, from auriferous and argentiferous pyrite, chalcopyrite and galena, with quartz gangue, occurring in 6 parallel veins traceable 800'. Main shaft is 300', with considerable ore blocked out for stoping. Has a good surface plant and smelter with a 70-ton matting furnace, blown in August, 1902. A tram-line connects the mine and concentrator. Property is served by a branch of the Georgia Central Railway. Property carries good values and is of considerable promise, but needs more extensive development and a better plant.

SEMINOLE MINING CO.

GEORGIA.

Property sold, 1904, by the sheriff, to Carl Henrich.

SENECA MINING CO.

MICHIGAN.

Office: 199 Washington St., Boston, Mass. Organized under laws of Michigan, with capitalization \$1,000,000, shares \$25 par. Albert S. Bigelow, president; W. J. Ladd, secretary and treasurer. Lands, 1,880 acres, lying just north of the Mohawk and Ahmeek mines, in Keweenaw county, Michigan. The Ahmeek was set off from the Seneca in 1880. Two shafts were sunk to the depth of about 200' each in 1880, since when no mining work has been done. Developments to the southward render it certain that the Seneca must carry the Kearsarge amygdaloid under a considerable portion of its lands, hence development work may be anticipated in the future, though as yet no steps have been taken in that direction.

SOCIEDAD MINERA SERENA.

CHILE.

Mine office: La Serena, Coquimbo, Chile. Has steam power and employs about 100 men.

SERRAZANO COPPER CO., LTD.

ITALY.

Registered March 28, 1903, in Guernsey, with capitalization £80,000, shares £4 par, to acquire copper mines at Serrazano, Italy. No further particulars secured.

SEVILLE SULPHUR & COPPER CO., LTD.

SPAIN.

Offices: 30, George Square, Glasgow, Scotland. Spanish general offices: Patio de Banderas, Sevilla, Spain. Mine offices: Almonáster La Real, Huelva, Spain. Capitalization, £120,000, shares £10 par. Jas. Pipe, chairman; John Munro, secretary; John L. Macdougall, general manager; Robert Andrew, engineer. Lands include the Cuchichon and adjoining mines, at Almonáster, producing cupriferous iron pyrites of good sulphur tenor. Pro-

duction is estimated by company at about 2,000 long tons of fine copper for 1904-5.

SEVEN DEVILS MINING & DEVELOPMENT CO.

IDAHO.

Letter returned unclaimed from former office, 63 Devonshire St., Boston, Mass.

SEYMOUR COPPER MINING CO., LTD.

BRITISH COLUMBIA.

Offices: 41, John Dalton St., Manchester, Eng. H. J. Challoner, secretary. Capitalization, £2,000. Organized June 25, 1900, to acquire copper properties at Seymour Narrows, Vancouver Island, B. C.

SHAFTER MINING CO.

COLORADO.

Mine office: Idaho Springs, Clear Creek Co., Colo. Arthur H. Roller, superintendent. Ores carry gold, silver and copper. Has steam and electric power, and employed about 20 men at last accounts.

SHAMBLURGSKI WORKS.

RUSSIA.

Office: care of A. A. Brolí, owner, Tiflis, Russia. Property is sundry mines and a small smelter, in the Russian Caucasus.

SHANNON COPPER CO.

ARIZONA.

Office: 52 Broadway, New York. Mine office: Clifton, Graham Co., Ariz. Employs about 500 men, miners being mainly Mexicans. Organized 1899, under laws of Delaware, with capitalization \$3,000,000, shares \$10 par. Bonds, \$480,000 outstanding, at 7%. Places \$60,000 yearly in a sinking fund for bond redemption. Has about 1,300 shareholders. Controls the Coronado Mining Co. through ownership of 51% of stock issue. Geo. C. Gill, president; Berthold Hochschild, vice-president; Chas. Hayden, secretary and treasurer; preceding officers constitute the executive committee; preceding officers, Chas. Brooker, Alfred A. Cowles, Fredk. L. Ames, James Virdin and Dr. Leonard Wheeler, directors; I. W. Palmer, assistant treasurer; Rollo B. Watson, general manager; Will T. Climo, mine superintendent; Wm. Carkeek, mill superintendent.

Lands, 43 claims, area 400 acres, at Metcalf, in the Greenlee district, also 400-acre mill and smelter sites. The Shannon has a side-line agreement with the Arizona Copper Co., by which extra-lateral rights are mutually waived, and all possibility of future litigation removed. Ore occurs as very irregular bodies between limestone and porphyry, these having very heavy gossan cappings of fairly good hematite, oxidized ores favoring the limestone, while ore deposits of the porphyry are mainly silicious sulphides, silicious ores predominating. The mine shows oxide and carbonate ores, averaging from 4% to 10% copper, in the upper levels, and sulphide ores, averaging from 3% to 7% copper, in the lower workings, the sulphide ores being mainly chalcopyrite, with more or less chalcocite. The mine is opened by shafts and tunnels to a depth of 1,100' from the crest of the mountain, mine openings being timbered with 12x12" square sets. The mine has upwards 6 miles of underground openings, with ore reserves estimated at 400,000 tons. There is some question as to whether ore values are holding at depth. The Little Coronado mine shows 3% to 5% copper. The Hanson tunnel is said to show an ore body of 180' width averaging 6% copper. The mine has two double-

track working tunnels, of which one, 7x8' in size and 715' long, is connected with a 1,400' double-track incline tram leading to the Coronado railroad, with 6 ore bins at either end, the track having an inclination of 36°. The incline has 10-ton cars operated in counterbalance, the steel cable passing around a 13' double drum at the top, which, in addition to lowering the loaded and raising the empty cars, runs a small air-compressor that generates power while serving as an auxiliary brake. The company maintains general stores at Clifton and Metcalf.

The concentrator, located on the San Francisco river, 8 miles from the mine, is of steel, in two connected sections, the 64x95' upper section having a 9x15" Blake crusher at the ore bin, Huntington mills and a 220' Robins belt conveyer, trommels and jigs. The 57x144' lower section has 33 Frue vanners, 1 Wilfley and 2 Standard tables. The 32x50' steel power-house has two 250-h. p. Stirling water-tube boilers, and a 300-h. p. Nordberg tandem compound engine. Water is taken from wells near the river by a 600-gallon electric triplex pump. The concentrator treats about 400 tons of ore daily, this averaging 3.5% to 5.5% copper, and puts about 5 into 1, effecting a saving of about 75% of contained values.

The smelter, at Clifton, 7 miles from the mines, is designed for five 250-ton water-jacket blast-furnaces, with 2 installed, these being 42x170' each at the tuyeres, and of about 350 tons daily capacity each. Above the charging floor are 23 ore bins, each 20x20x16', with chutes. A 10' dust-flue leads to a 20x20x100' dust-chamber, with bottom of hoppers discharging periodically into cars on a railroad track in the tunnel beneath. The fumes pass from this dust-chamber through a 170' flue to a 150' steel smokestack. A 60x80' power-house, of steel, on stone foundations, houses a 300-h. p. tandem compound condensing engine, direct-connected to blowers with capacity of 3,000 cubic feet of free air per minute. The smelter has a slag-line, with electric locomotive. The briquetting plant for flue-dust and fines has a daily capacity of 60 tons. Only one furnace is kept in blast, this treating daily about 80 tons of concentrates and about 100 tons of smelting ore averaging 5% to 7%. Smelting of the Standard ores, formerly done on contract, was suspended at close of 1904, owing to a dispute over smelting charges. Product of the smelter is a matte of 55% to 60% copper tenor, converted at the works of the Arizona Copper Co.

Production of 1904 was 11,899,920 lbs. fine copper, made at a net profit of \$162,433, showing costs of about 11 cents per pound for refined copper at the Atlantic seaboard. Present mining costs are \$1.27 per ton, exclusive of development work, cost of which is charged direct to operating expense. Results to date have proven disappointing, but the mine should make good profits during 1905, as it is in the hands of a competent and careful management.

SHASTA COPPER MINING CO.

CALIFORNIA.

Mine office: Shasta, Shasta Co., Cal.

SHASTA GOLD & COPPER CO.

CALIFORNIA.

Office: 326 Post St., San Francisco, Cal. Capitalization \$500,000,

shares \$1 par. W. F. Mitchell, president and general manager; W. E. von Johannsen, secretary. Lands, 14 claims, in the Dog Creek district, about 12 miles north of Redding, Shasta Co., Cal., claimed to show 3 gold-bearing quartz veins and 2 copper veins. Company regarded with much suspicion.
SHASTA MAY BLOSSOM MINING & SMELTING CO. CALIFORNIA.

Reorganized, 1903, as the Shasta May Blossom Copper Co., Consolidated.
SHASTA MAY BLOSSOM COPPER CO., CONSOLIDATED. CALIFORNIA.

Office: 42 Bacon Block, Oakland, Cal. Mine office: De Lamar, Shasta Co., Cal. Organized, 1903, as a reconstruction of the Shasta May Blossom Mining & Smelting Co., with capitalization \$10,000,000. Morton Lindley, president and general manager; L. A. Booth, vice-president; S. Peter, secretary; C. H. Davis, superintendent. Lands, 18 claims, area circa 250 acres, owned in fee, in the Copper City or Pittsburg district, about 3 miles north of the Bully Hill mine and about 27 miles northeast of Redding. Country rocks are slates and quartz-porphry, showing 3 fissure veins, of which one, known as the Middle vein, ranges 5' to 40' in width, traceable 900', with schistose and porphyritic walls, carrying low-grade auriferous iron-copper sulphides, with spar gangue. Mine is opened by tunnels, with about 1,300' of openings. Has steam power, and is supposed to have a 5-stamp mill. Company apparently spends more for advertising than for mining.

SHATTUCK-ARIZONA COPPER MINING CO. ARIZONA.

Mine office: Bisbee, Cochise Co., Ariz. Organized March, 1904, under laws of Arizona, with capitalization \$2,500,000, shares \$10 par. Thomas Bardon, president; Thomas Bardon, A. Guthrie, Martin Pattison, A. M. Chisholm and L. C. Shattuck, directors; Byron M. Pattison, superintendent. Lands, 6 claims, area circa 120 acres, lying just north of the Pittsburg & Duluth, and northwest of the Wagner and Hope claims of the Calumet & Arizona. Owing to the rugged, not to say precipitous, topography of the lands, tunnels are impracticable, neighboring companies holding all available tunnel sites, hence development is by shaft, which at a depth of 525' struck 6' of 12% carbonate and oxide ore, about March 1, 1905. Management is composed of solid men of successful mining experience, and property is considered decidedly promising.

SHAW-GIBSON MINING CO. NEW MEXICO.

Mine office: Lordsburg, Grant Co., N. M.

SHAWMUT MINING CO. UTAH.

Office: Boston, Mass. Mine office: Bingham Canyon, Salt Lake Co., Utah. W. B. Andrews, manager. Apparently moribund.

SHEEP MOUNTAIN MINING & TUNNEL CO. COLORADO.

Letters returned unclaimed from Crystal, Gunnison Co., Colo.

SHELDEN & COLUMBIAN MINE. MICHIGAN.

Owned by J. H. Rice, et al, Houghton, Mich. Lands, next north of Isle Royale mine. Idle since 1870. Fully described in Volumes I and II.

SHOSHONE MINE. NEW MEXICO.

Office and mine: care of Gusdorf Bros., owners, Amizett, Taos Co., N. M. Ores carry gold and copper. Has water power and 10-stamp mill.

SHOTWELL TRI-MOUNTAIN COPPER CO.**ARIZONA.**

Office: 323 Security Bldg., St. Louis, Mo. Mine office: Ajo, Pima Co., Ariz. Is organized under laws of Arizona and is supposed to own the Shotwell mine, a rather promising property, slightly developed, but a long distance from rail connections.

SHRIVER MINE.**TEXAS.**

Near Llano, Llano Co., Texas. Main shaft, -385'. Idle.

SHUTTLETON MINE.**AUSTRALIA.**

Mine office: Shuttleton, N. S. W., Australia. Property, in the Crowl Creek district, is opened to depth of 330', bottom level showing a 12' vein with 4' pay-streak of chalcopyrite assaying 22% copper.

SIBILSKY-CHAPMAN TRACT.**MICHIGAN.**

An exploration, in 4-57-31, Keewenaw county, near Calumet, Michigan.

SIERRA CO., LTD.**SPAIN.**

Offices: 75, Lombard St., London, E. C., Eng. Mine office: 10, Plaza del General Santacildes, Burgos, Spain. Organized April 2, 1898, with capitalization £400,000, shares £10 par. Debentures, £478,000, at 5%. T. Evans, secretary. Lands, sundry mines, carrying iron, copper, silver and coal, in the provinces of Burgos and Logroño, Spain.

SIERRA DE COBRE MINE.**MEXICO.**

Office: 99 John St., New York, N. Y. Mine office: La Cananea, Sonora, Mex. Employs 100 men. Property is controlled by Phelps, Dodge & Co. Jas. Douglas, president; Geo. Notman, secretary and treasurer; Walter Douglas, general manager; Geo. A. Laird, superintendent. Lands, 100 pertenencias, area 247 acres, about three miles northwest of the Cananea smelter, and surrounded by holdings of the Greene Consolidated. Litigation over title was settled satisfactorily in 1904. Country rocks are quartz, limestone and porphyry, with a large gossan outcrop showing more or less conglomerate, with 3 veins of about 25', 100' and 125' average width, carrying low-grade ores, developed by 5 shafts, deepest 450', and 3 tunnels, longest 2,000', with several miles of underground openings. Machinery equipment includes 4 steam hoists and 1 gasoline hoist. Buildings are engine-houses, assay office, store, boarding house and dwellings. Management is of the best and property is regarded as likely to make a good mine.

SIERRA MADRE EXPLORATION, LTD.**MEXICO.**

Offices: Throgmorton House, Copthall Ave., London, E. C., Eng. J. K. Pollock, chairman; A. H. Dawbarn, secretary. Capitalization, £60,000, shares 25s. par; issued, £40,000. Lands, 200 pertenencias, carrying gold, silver and copper, also rights to 46,000 acres of timber lands, in the Sierra Madre mountains, states of Chihuahua and Sonora, Mexico.

SIERRA MORENA COPPER MINES, LTD.**SPAIN.**

Offices: 2, Basinghall Ave., London, E. C., Eng. Mine office: Peñafior, Sevilla, Spain. Organized April, 1900, with capitalization £80,000, shares £1 par; issued, £60,000. J. E. G. Haddath, secretary; R. Stanton, mine manager. Lands, 12 hectareas, including La Preciosa and adjoining mines. Properties supposed to have passed to control of Sociedad Anonima Minas de Peñafior.

MINAS DE SIERRA NEVADA.**SPAIN.**

Mine office: Guejar Sierra, Granada, Spain. Owned by a Belgian company. Have argentiferous copper ores.

SIERRA DE ORO GOLD MINING & MILLING CO.**ARIZONA.**

Office and mine: Clifton, Graham Co., Ariz. F. T. Eldredge, president; W. H. Waite, secretary and treasurer; L. P. Potter, manager; Benj. M. Crawford, superintendent. Lands, 15 claims, near the Clifton Consolidated, also a 5-acre millsite on the San Francisco river. Development is by tunnels, showing 4 parallel blind veins. A 550' crosscut tunnel shows a 10' vein giving assay values of 14% copper and up to \$10 gold per ton, and a 4' vein giving assays of 14% copper and \$48 gold per ton. Company and property well regarded, and active development is in progress.

SIERRA-ALTO COPPER MINING CO.

Letter returned unclaimed from former office 60 State St., Boston, Mass.

SIERRA-PACIFIC SMELTING CO.**MONTANA & MEXICO.**

Office: 440 Temple Court, Minneapolis, Minn. Mine office: Butte, Silver Bow Co., Mont. Organized, 1903, under laws of Arizona, with capitalization \$2,500,000, shares \$1 par. Geo. Girling, president; Dr. H. A. Mumaw, vice-president; A. F. Moffatt, secretary and treasurer. Company owns sundry claims in Sonora, also has large stock interests in the Bagdad Mining & Milling Co. of South Dakota, the Yukon Mining Co., and several other corporations, including practically the entire ownership of the Jennie Dell Mining Company, of Butte. Lands of the Jennie Dell are 2 patented claims, area 22 acres, in Butte, showing three ore bodies, of which 1 fissure vein, averaging 4' in width, is developed by a 450' main shaft with 1,050' of underground openings, showing ore averaging about 2% copper, 30 oz. silver and \$5 gold per ton, with more or less lead and zinc. Has steam power, hoist, pumps, etc., and plans deepening the shaft 150' and extending drifts during 1905.

SIERRA-SONORA SMELTING CO.**MEXICO.**

Title changed, 1903, to Sierra-Pacific Smelting Co.

MINAS DE SIERRACILLA DEL TAMUJOSO.**SPAIN.**

Mine office: Puebla de Guzmán, Huelva, Spain. C. & J. Sundheim, owners; Wm. Guthrie Bowie, manager, Alosno, Huelva, Spain. Some ore shipments were made by former operators, but ore is complex and requires special treatment. Idle.

SIERRITA MINING & MILLING CO.**ARIZONA.**

Office: Tucson, Ariz. J. P. Owen, general manager, at last accounts.

SIGNET GOLD & COPPER MINING CO.**UTAH.**

Office: care of E. E. George, secretary, Salt Lake City, Utah. Mine office: American Fork, Utah Co., Utah. C. E. Stewart, president; A. W. Lister, treasurer. Organized November, 1903, under laws of Utah, with capitalization \$75,000, shares 25c par. Property is the Signet group of 4 claims, in the American Fork district, on which a little development has been secured.

SILERS MEADOWS COPPER CO.**NORTH CAROLINA.**

Mine office: Bushnell, Swain Co., N. C. Lands, circa 1,900 acres, in the

Smoky Mountains, on the Tennessee copper belt. Has 11 shafts and tunnels, all showing ore giving average assays of 5.5% copper and \$1.80 silver and gold per ton. Property regarded as promising.

SILVER BAR COPPER MINING CO.

NEW MEXICO.

Property sold to Mogollon Gold & Copper Co.

SILVER BELL COPPER CO.

ARIZONA.

Title changed to Imperial Copper Co.

SILVER CITY REDUCTION WORKS.

NEW MEXICO.

Owned by Comanche Mining & Smelting Co.

SILVER CLIFF GOLD & COPPER MINING CO.

MONTANA.

Letter returned unclaimed from former mine office, Salt Lake, Missoula Co., Montana.

SILVER CONNOR MINE.

NEVADA.

Mine office: Eureka, Eureka Co., Nev. Has blocked out about 50,000 tons of low-grade ore, averaging about \$6 in gold and silver, and shipped a little high-grade ore, averaging 27.9% copper, to a Salt Lake smelter, in 1903.

SILVER CREEK GOLD MINING CO.

WASHINGTON.

Letter returned unclaimed from former office and mine, Index, Snohomish county, Washington.

SILVER FLAT MINING & MILLING CO.

UTAH.

Office: care of Abel John Evans, Lehi, Utah. Capitalization \$50,000, shares 10c par. Lands, 5 claims, in the American Fork Canyon, Silver Lake district, Utah county, carrying auriferous and argentiferous copper and lead ores.

SILVER GLANCE GROUP.

NEW MEXICO.

Office and mine: care of Joseph Oliver, owner, Chloride, Sierra Co., N. M. Employs 12 men. Lands, 6 claims, area 120 acres, also a millsite, in the Apache district, showing 7 fissure veins averaging 4' width, giving assays of 10% copper, 30 oz. silver and \$10 gold, from sulphide ores, opened by shafts of 60', 100', and 110' and tunnels of 120' and 125'.

SILVER HILL MINING CO.

NORTH CAROLINA.

Mine office: Silver Hill, Davidson, Co., N. C. J. M. Prim, superintendent. Ores carry gold, silver, lead, copper and zinc. Has steam power and mill with 5 stamps, crusher and rolls, employing about 40 men, at last accounts.

SILVER KING MINING CO.

UTAH.

Mine office: Park City, Summit Co., Utah. Hon. Thos. Kearns, general manager; W. J. Dalley, superintendent. Ores carry gold, silver, lead and copper. Has steam power and 250-ton concentrator, employing 300 men. This is one of the famous silver mines of the world, and secures a little copper as a by-product.

SILVER LAKE MINES.

COLORADO.

Owned and operated by Guggenheim Exploration Co.

SILVER MONUMENT MINE.

NEW MEXICO.

Mine office: Chloride, Sierra Co., N. M. B. S. Phillips, superintendent. Ores carry silver, gold and copper. Has steam power and a 5-stamp mill.

SILVER MOUNTAIN MINING CO.**COLORADO.**

Mine office: Empire, Clear Creek Co., Colo., M. B. Stewart, manager. Ores carry gold, silver and copper. Has steam power and a small stamp mill.

SILVER SHIELD MINE.**UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. Has a 4' vein giving assays of 8% to 10% copper, 50 oz. to 100 oz. silver and \$9 to \$15 gold per ton. Also has considerable milling ore shown by various openings.

SILVER SPUR MINING CO.**AUSTRALIA.**

Office and mines: Silver Spur, Stanthorpe district, Queensland, Australia. Employs 67 men. Organized 1897, under laws of Queensland, with capitalization £24,000, shares, £1 par, 15s. paid in. Has paid dividends of £18,300. Robert T. Vyner, chairman; Edgar Hall, secretary, treasurer and general manager; Richard Prout, mining captain. Lands, 45 acres, leasehold from crown, showing 4 lenses averaging 8' in width and 100' in length, with varying depths, carrying sulphide ores returning 1% copper, 12% lead, 20% zinc, \$1 gold and 25 oz. silver per ton. Has 4 shafts, deepest 300' with about 12,000 tons of ore blocked out for stoping. Has steam plant, including hoist, 5-drill air-compressor, crusher, Chilean mill, etc., also a sawmill and smelter, which receives ore by tramline, and has two 42x100" Austin water-jacket pyritic blast furnaces, daily capacity 60 tons each, and 2 reverberatory furnaces, daily capacity 15 tons each. Product is turned out as 33% matte, carrying 900 to 1,000 oz. silver per ton, sent to Europe for refining. Production for 1903 was 71,680 lbs. fine copper.

SILVER TIP GOLD MINING CO.**WASHINGTON.**

Office: Tacoma, Wash. Mine office: Maple Falls, Wash. Chas. P. Topliff, superintendent. Ores carry gold, silver and copper.

SILVERMAN-ALASKA GROUP.**ALASKA.**

Mine office: care of Sam Silverman, manager, Ketchikan, Alaska. Said to be organized under laws of New Jersey. Lands, on Prince of Wales Island, Alaska, are said to show auriferous copper ores of good grade, with considerable development.

SILVERSMITH MINE.**MONTANA.**

Mine office: Basin, Jefferson Co., Mont. T. J. Sweeney, manager. Ores carry gold, silver and copper. Has steam power.

SILVERTON MINING CO.**COLORADO.**

Mine office: Silverton, San Juan Co., Colo. J. H. Starkweather, superintendent. Lands, on Sultan Mountain, include the North Star mine, producing ores of gold, silver and copper. Has steam and water power and 60-stamp mill.

SILVERTON MINING CO.**WASHINGTON.**

Mine office: Silverton, Snohomish Co., Wash. Was developing a vein carrying ores of gold, silver and copper, near the Bonanza Queen mine, at last accounts.

SIMILKAMEEN COPPER MINES.**BRITISH COLUMBIA.**

Stuart Armour, president. Capitalization \$200,000, shares 10c par. Lands, supposedly somewhere in the Similkameen district of British Columbia.

SIMSBURY MINE.**CONNECTICUT.**

A small, old and idle property, at Granby, Hartford Co., Connecticut.

SINAI MINING SYNDICATE.**ARABIA.**

Mine office: Mt. Samarah, Arabia, care of G. Beyts & Co., Suez, Egypt. M. Wanner, mine manager. Company is reopening old copper mines, worked by the early dynasties of Egyptian kings, and abandoned probably some 1,500 years before the Rio Tinto was first opened by the Phoenicians, circa 1000 B. C.

SINALOA EXPLORATION CO.**MEXICO.**

Office: Commonwealth Trust Bldg., St. Louis, Mo. Capitalization \$500,000, shares \$1 par. Geo. B. Clark, president; Dr. H. H. Born, secretary; Chas. Wiggins, treasurer; preceding officers, Chas. H. Filley, John Hartman, Henry Leschen, Chas. M. Rhoades and W. S. S. Rodgers, directors. Lands, sundry claims and 7 square miles of miscellaneous timber and mineral lands, about 80 miles northeast of Mazatlán, in the state of Sinaloa, Mexico. Property includes the Santa Eduwiges and La Luz mines, which have been disposed of for stock interests, to the Metates Mining Co. and one other new corporation.

SINBAD MINE.**MONTANA.**

Mine office: Butte, Silver Bow Co., Mont. Lands, just north of the Pittsburg & Montana, in East Butte, have a 600' shaft. Idle.

SISKIYOU GOLD & COPPER CO.**CALIFORNIA.**

Office: 326 Post St., San Francisco, Cal. Mine office: Rollins, Siskiyou Co., Cal. Lands, 8 claims, area 160 acres, on the state road between Yreka and Rollins, Siskiyou county. Regarded with much suspicion, because stock was peddled by the notorious Pacific States Mining & Investment Co.

SISKIYOU GOLD & COPPER MINING CO.

Office: 44 Central Blk., Salt Lake City, Utah.

SISKOWIT MINE.**MICHIGAN.**

Located near Rock Harbor, Isle Royale, Michigan. Worked, 1845-1855, on a 5' amygdaloid vein carrying sheet copper in contact with walls, opened by a 500' main shaft. Made about 150 tons of copper. Idle since 1855.

MINA LA SIVERIA.**MEXICO.**

Office and mine: care of E. Torres, owner, Topia, Durango, Mex.

SIX EAGLES MINING CO.**WASHINGTON.**

Office: Olympia, Wash. Mine office: Loomis, Okanogan Co., Wash. Robt. Frost, superintendent. Ores carry gold, silver, lead and copper. Has gasoline power.

SJANGELI MINES.**NORWAY & SWEDEN.**

Mine office: Sjangeli, Norway. Property includes the Sjangeli, Mina Alakats, Valfojokk and Ruopsuokjaure groups, partly in Norway and partly in Sweden. Country rocks are hornblende schists, with narrow strata of limestone and lenticular bodies of massive gabbro, ores occurring in the schists as cuprite, bornite, chalcocite and chalcopyrite, giving assays of 2.5% to 55% copper, with an average assay tenor of about 12.5%. Lands

are about 30 miles from the coast, with good water-power available. Property regarded as valuable.

SKOVVASFJELDETS AKTIEBOLAG.

NORWAY.

Mine office: Haran, Norway. N. Tiskum, manager, at last accounts.

SKYLARK COPPER MINING & SMELTING CO.

UTAH.

Office: 40 Commercial Blk., Salt Lake City, Utah. Mine office: Blue Acre, Beaver Co., Utah. Organized May, 1899, under laws of Utah, with capitalization \$75,000, shares 25c. par. Is under same management as O. K. Extension Mining & Reduction Co. A. J. McMullen, president and general manager; E. A. Cook, secretary and treasurer; Frank Savage, superintendent. Lands, 10 claims, area 200 acres, in the Beaver Lake district, showing a 4' contact vein between limestone and granite, opened by shafts of 150' and 365' and by 6 tunnels, longest 155', showing chalcopryite and galena, estimated by company to average 5% copper and 6 oz. silver from copper ore, and 40% lead, 76 oz. silver and \$2.50 gold per ton, from lead ore. Has gasoline power. Property regarded as promising.

SLATE CREEK MINING CO.

ARIZONA.

Mine office: Prescott, Yavapai Co., Ariz. Percy Williams, manager. Property is the Blue Lick mine, carrying gold, silver, lead and copper ores. Has electric and gasoline power and 50-ton smelter.

SLATE CREEK MINING & MILLING CO.

WYOMING.

Office: Wheatland, Wyo. M. F. Montgomery, superintendent.

SLATER COPPER MINES CO.

MISSOURI.

Office: Willow Springs, Mo. Lands are in Shannon Co., Mo. Idle.

SMELTING & REFINING CO. OF

AUSTRALIA.

AUSTRALIA (1901), LTD.

Offices: 120, Bishopsgate St., London, E. C., Eng. Works office: Dapto, New South Wales, Australia. S. Wheeler, chairman; W. L. Hoyt, general manager; E. J. Rogers, superintendent; C. J. Pryer, secretary. Organized Oct. 29, 1901, as a reconstruction of the Smelting Company of Australia, with capitalization £650,000, shares £1 par; issued, £551,131. Debentures, £100,000, at 5%. Property is 300 acres, freehold, improved by a smelting and refining plant and sulphuric acid works, a 2.5-mile private railroad and a controlling interest in Webb's mine. Smelter has a daily capacity of about 400 tons, and further increase is contemplated.

SMOKEHOUSE MINING CO.

MONTANA.

Office and mine: Butte, Silver Bow Co., Mont. Bernard Noon, general manager. Has steam power and 500' two-compartment shaft.

SNOHOMISH & TRAMWAY MINES.

MONTANA.

Mine office: Butte, Silver Bow Co., Mont. John S. Harris, receiver. Idle, owing to three-cornered litigation between F. A. Heinze, Clara Larkin and the Butte & Boston Consolidated Mining Co. Courts have decided that the Butte & Boston owns two-thirds of the Tramway and one-half of the Snohomish. Generally considered valuable properties.

SNOWBIRD MINE.

MONTANA.

A property at Butte, Silver Bow county, Montana, in dispute between the Montana Ore Purchasing Co. and the Anaconda Copper Co.

SNOWSHOE COPPER MINING CO.**MONTANA.**

Supposedly has copper claims somewhere in Montana.

SNOWSHOE GOLD & COPPER MINES, LTD. **BRITISH COLUMBIA.**

Sold, 1904, to British Columbia Copper Co., Ltd.

SNOWSTORM GOLD & SILVER MINING & MILLING CO. **COLORADO.**

Mine office: Durango, La Plata Co., Colo. J. E. Downer, manager.

Ores carry gold, silver, copper and mercury. Has water power and 10-stamp mill.

SNOW STORM MINING CO.**IDAHO.**

Mine office: Mullan, Shoshone Co., Idaho. Employs 80 men. Organized 1899, under laws of Idaho, with capitalization \$1,250,000, shares \$1 par. H. H. Burns, president; Thos. Donnelly, vice-president and general manager; F. J. Edwards, secretary and treasurer; F. L. Taft, superintendent; J. H. Hewand, mine superintendent. Lands, 8 claims, 6 patented, area 160 acres, also a 2-acre millsite, in the Hunter district, showing a fissure vein of about 20' average width, opened by a 200' shaft and tunnels of 200', 600' and 1,800', with 3,600' of mine openings, estimated by company to show 500,000 tons of ore blocked out for stoping. Ores are oxides and carbonates, giving average returns of 4% copper and 8 oz. silver, with a trace of gold. Water power is employed and a leaching plant is being built. Upper levels of mine are operated by J. H. Hewand & Co., under a five year-lease, on royalty. Property is regarded as one of considerable promise.

SOCORRO GOLD CO.**ARIZONA.**

Office and mine: Harrisburg, Yuma Co., Ariz. Employs 20 men. Organized 1901, under laws of Arizona, with capitalization \$500,000, shares \$1 par. Geo. D. Workman, president; S. C. Workman, secretary; F. C. Smith, general manager. Lands, 10 claims, area 200 acres, in the Ellsworth district, showing a fissure vein of 2' width, carrying covellite and chalcopyrite assaying about \$10 gold and 5 oz. silver per ton, with small copper values, developed by a 667' shaft, and 11 tunnels, with 2,467' of underground openings, having 5,000 tons of ore blocked out for stoping. Has a 20-stamp mill, 3 Standard concentrators and cyanide plants of 10 tons and 50 tons daily capacity.

SOLACE COPPER MINING CO.**ARIZONA.**

Office and mine: Globe, Gila Co., Ariz. Ignatius Schlinger, president; W. P. Morey, secretary. Capitalization \$500,000, shares \$1 par. Lands, 5 claims, near the Bloody Tank mine, 8 miles from Globe.

MINAS SOLEDAD y ANEXAS.**MEXICO.**

Mine office: Ameca, Jalisco, Mex. Chris. O'Brien, manager.

SOLMS-BRAUNSFELS'SCHE BERGWERKE.**GERMANY.**

Mine office: Braunsfels, Rheinprovinz, Germany. Herr Bergassessor Bellinger, manager. Has ores of iron, manganese and copper.

SOLOMON SPRINGS COPPER MINING CO.**ARIZONA.**

Property is under bond and lease to Houghton Development Co.

SONGATOF MINE.**RUSSIA.**

A small producer in the Russian Altai.

SONOMA MINES OF MEXICO, LTD.**MEXICO.**

Offices: 4, Great Winchester St., London, E. C., Eng. Mine office:

Avino, Durango, Mex. G. H. Johnson, secretary; W. B. Jeffrey, general manager; E. L. Wagner, superintendent. Organized Nov. 4, 1899, with capitalization £500,000, shares £1 par; issued, £450,400. Lands, 415 acres, carrying ores of gold, silver and copper, the Sonoma claims showing an ore body averaging 2.5% to 4% copper, with fair gold and silver values, while the Malinche claim is said to show an immense body of low-grade ore, carrying up to 10% copper, with small gold and silver values. Has steam power and employs a considerable force.

SONORA CHIEF MINING CO.**SONORA.**

Office: 323 American Bank Bldg., Kansas City, Mo. Organized July 18, 1904, under laws of Arizona, with capitalization \$1,500,000, shares \$1 par. Lands, sundry claims in the Ures district, Sonora, Mexico.

SONORA COPPER COMPANY OF MEXICO.**MEXICO.**

Assets, consisting of a lawsuit, sold to Puertecito Copper Co.

SONORA DEVELOPMENT CO.**MEXICO.**

Office: 603 New Ridge Bldg., Kansas City, Mo. Mine office: Moctezuma, Sonora, Mex. Organized under laws of Arizona, with capitalization \$1,000,000. Wm. Huttig, president; John W. Amerman, secretary; Jas. E. Lawrence, engineer. Lands, 98 pertenencias, area about 240 acres, including the Don Genaro y Anexas, Nacozari Copper Queen, Wostenholm, Conforme, Goodlander, Santa Clara, Cuahamoc and La Verde groups. The Nacozari Copper Queen, area about 65 acres, lies between the Nacosari and Belle Union mines of the Moctezuma Copper Co., giving ore assaying up to 58% copper. Some development has been secured by shafts and tunnels on sundry copper, silver and gold properties.

SONORA MINING CO.**MEXICO.**

Office: 406 Post Bldg., Battle Creek, Mich. Mine office: Fuerte, Sinaloa, Mex. Organized under laws of Wyoming, with capitalization \$2,000,000, shares \$1 par. J. C. Barber, president; Harry A. Clapp, general manager; D. H. Livingston, superintendent. Lands, 149 pertenencias, area 368 acres, in the Alamos district of Sonora, shows ores giving assays up to 14% copper and 40 oz. silver per ton, also sundry claims in Sinaloa, latter showing auriferous copper ores. About 25 men are employed on the Sinaloa property and company plans installing a 15-ton smelter there.

SONORA MINING & MILLING CO.**MEXICO.**

Office: care of E. J. Snyder, secretary, Utica, N. Y. Organized under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Said to have been reorganized, 1904. Capt. J. H. Smith, president; John Worthington, vice-president; Miss Belle McKinnon, treasurer; Con. O'Keefe, general manager. Had 320 pertenencias, including the Penasco, Cobrecita and Fortuna groups, at Tubutama, Sonora, Mexico, on which a Vulcan furnace proved a failure. This property is said to have been abandoned, and efforts concentrated on the Juárez gold mines, about 50 miles west of Altar, Sonora, Mexico where a 20-stamp mill and cyanide plant have been erected. Affairs of company have been badly managed.

JOSE' SOSSI.**BOLIVIA.**

Office and mine: Coro Coro, La Paz, Bolivia. A small operator, having a mine equipped with steam power and employing about 30 men.

COMPANHIA MINEIRA DE SOTIEL CORONADA.**SPAIN.**

Offices: Rua dos Sapateiros 22, Lisbon, Portugal. Mine office: Calañas, Huelva, Spain. Senhor Dom Augusto Fuschini, chairman; Thos. Morrison & Co., agents at Calañas. Lands, 666 hectares, including 34 old mines carrying cupriferous iron pyrites. Is working steadily, in a rather small way. Latest reported production was 795 long tons refined copper, in 1899.

SOCIEDAD ANONIMA MINAS DE SOTO.**SPAIN.**

Office: Bilbao, Spain. Mine office: Reinosa, Santander, Spain.

SOUTH AFRICAN COPPER ESTATES, LTD.**CAPE COLONY.**

Offices: 124, Chancery Lane, London, W. C., Eng. F. W. H. Durant, secretary. Capitalization, £5,000; issued, £557. Lands, supposedly in Namaqualand, Cape Colony, South Africa.

SOUTH AFRICAN GOLD & COPPER MINING SYNDICATE, LTD.

Offices: 54, Gresham St., London, E. C., Eng. Registered November 24, 1903, with capitalization £15,000. E. G. Knight, J. W. H. Barr, F. Gartside and F. Moore, directors.

SOUTH AMERICAN DEVELOPMENT CO.**PERU.**

Succeeded by Cerro de Pasco Mining Co.

SOUTH AUSTRALIAN COPPER SYNDICATE, LTD.

Offices: 13, St. Helen's Pl., London, E. C., Eng. Never did business.

SOUTH BISBEE COPPER MINING & TOWNSITE**ARIZONA.****IMPROVEMENT CO.**

Wound up. Lands sold to Lake Superior & Pittsburg Mining Co.

SOUTH COLUMBUS MINING CO.**UTAH.**

Mine office: Alta, Salt Lake Co., Utah. Organized Feb. 11, 1904, as successor of the Bingham-Centennial Mining Co., with capitalization \$300,000, shares \$1 par. Anthony O. Jacobson, president; J. Alexander Jacobson, vice-president and general manager; Walter L. Maas, secretary and treasurer. Lands, sundry claims, area 70 acres, also surface rights to 6 acres additional, about 4 miles from Park City. Has a 1,200' tunnel, idle because of water, and is opening a new tunnel which will give a back of 700', as compared with 300' in the old tunnel. Ores are slightly auriferous and argentiferous copper and lead sulphides, the former averaging about 3.5% in copper tenor. Management is good, and property is considered promising.

SOUTH KEARSARGE MINE.**MICHIGAN.**

Owned and operated by Osceola Consolidated Mining Co.

SOUTH MOUNT LYELL MINING CO., LTD.**TASMANIA.**

Offices: 153, Leadenhall St., London, E. C., Eng., and 320, Collins St., Melbourne, Victoria, Australia. Mine office: Gormanston, Montague Co., Tasmania. J. P. Lonergan, chairman; G. Moore, acting chairman; H. M. Taylor, secretary in London; N. Madden, secretary in Melbourne; J. Ryan, mine manager. Capitalization, £600,000; issued, £496,150, shares £2 par, non-assessable. Lands, 93 acres on Mt. Lyell and 80 acres on Mt. Darwin.

former carrying 4% to 6% sulphide ore. Has shafts of 90' and 718' and 703' main tunnel. Idle since June 1, 1903.

SOUTH PEACOCK MINING CO.**IDAHO.**

Office: 88 State St., Boston, Mass. Mine office: Weiser, Washington Co., Idaho. Capitalization \$500,000. Thos. S. Wentworth, president; Wm. L. Pratt, secretary. Lands are in the Seven Devils district. Idle.

SOUTH RANGE MINING CO.**MICHIGAN.**

Office: 60 State St., Boston, Mass. Mine office: Houghton, Houghton Co., Mich. R. R. Goodell, president; H. W. Weason, treasurer; F. W. Nichols, secretary. Capitalization \$2,500,000, shares \$25 par. Lands are about 7,000 acres, undeveloped, lying mainly between the Globe and Belt properties, in Houghton and Ontonagon counties, Michigan.

SOUTH SIDE MINING CO.**MICHIGAN.**

Office: care of John C. Watson, 68 Devonshire St., Boston, Mass. Lands, 200 acres, west of the Decotah and north of the Naumkeag, with half-mile frontage on Portage Lake, west of Houghton, Houghton county, Michigan.

SOUTH THARSIS MINE.**TASMANIA.**

Sold to Mt. Lyell Mining & Railway Co., Ltd.

SOUTH WHEAL CROFTY CO.**ENGLAND.**

Offices: Carn Brea, R. S. O., Eng. Mine office: Illogan, Cornwall, Eng. F. Harvey, chairman; J. Penhall, manager; C. H. Paull, purser. Is operated on the cost-book plan, with 6,120 shares. Has tin and copper mines, equipped with a mill having 60 stamps and 14 vanners.

SOUTH YALE COPPER CO., LTD.**BRITISH COLUMBIA.**

Organized January, 1905, under laws of British Columbia, with capitalization \$450,000, shares \$1 par.

SOUTH-EAST AFRICA, LTD.**MOZAMBIQUE & ZAMBESIA.**

Offices: 80, Bishopsgate St., London, E. C., Eng. Dr. Carl Peters, managing director; T. M. C. Steuart, secretary. Registered July 11, 1898 (as Dr. Carl Peters' Estates & Exploration Co., Ltd., name changed to present title, October, 1903), with capitalization £150,000, shares £1 par; issued, £101,050. Debentures, £10,000 authorized, £8,325 issued, at 6%. Has the right to locate 500 claims of 500 acres each, on the lands of the British South Africa Chartered Company, and a similar number of claims, of similar area each, on lands of the Mozambique and Zambesia companies, and also has located 100 copper claims and 305 gold claims, on which exploratory work is in progress, with a little development secured.

SOUTHERN PACIFIC GOLD & COPPER MINING CO.**UTAH.**

Office: care of J. W. Burnham, secretary and manager, Salt Lake City, Utah. Capitalization \$300,000, shares 50c. par. Lands, in the Sierra Nevada district of Box Elder county, Utah, are said to show a vein of high-grade copper ore.

SOUTHERN STAR COPPER & SMELTING CO.

Letter returned unclaimed from former office, St. James Bldg., New York.

SOUTHERN ZINC & COPPER MINING CO.**ARKANSAS.**

Office: 708 University Ave., Rochester, N. Y. Mine office: Gillham, Sevier Co., Ark. Organized May 3, 1900, under laws of Arkansas, with capitalization \$2,000,000, shares \$100 par. E. J. Morley, president; E. S. Osborne, assistant secretary and general manager. Lands, 700 acres, in the Gillham district. Company was developing zinc property only, at last accounts.

SOUTHWEST AFRICA CO., LTD.**DAMARALAND.**

Offices: 3, Laurence Pountney Hill, London, E. C., Eng., and Unter den Linden 35, Berlin, Germany. G. Cawston, chairman. Capitalization, £2,000,000; issued, £1,000,000. Lands, mineral concessions over 22,000 square miles, including nearly 4,500 square miles of freehold, in Damaraland, and mining rights over 23,000 square miles in Ovamboland; total holdings include 40,000 square miles of freehold, with mining rights over 90,000 square miles additional, also sundry railroad concessions. It is planned to build a railway to reach the very promising copper deposits on this company's holdings in Damaraland.

SOUTHWESTERN COPPER & IRON CO.**NEW MEXICO.**

Lands leased to Burro Mountain Copper Co.

SOUTHWESTERN GOLD & COPPER CO.**ARIZONA.**

Office and mine: Douglas, Cochise Co., Ariz. D. W. Mitchell, superintendent. Lands, 7 claims, 10 miles east of Douglas, showing ores assaying up to 4.5 % copper and \$12 gold per ton.

SOUTHWESTERN MINE & SMELTING CO.**ARIZONA.**

Office: care of W. R. Fagan, manager, El Paso, Texas. Organized 1903, to build a custom smelter at Gleeson, Cochise county, Arizona.

SOUTHWESTERN SMELTING & REFINING CO.**ARIZONA.**

Office: 302 Mills Bldg., San Francisco, Cal. Works office: Benson, Cochise Co., Ariz. Employs 75 to 125 men. Organized 1904, under laws of Arizona, with capitalization \$500,000, shares \$10 par, in \$100,000 preferred 7% stock, and \$400,000 common stock. R. A. Boggess, president and general manager; A. J. Pidgeon, vice-president; Franklin Bowring, secretary; Walter L. Wiley, treasurer; Doane Merrill, assistant manager; Ralph M. Johnson, general superintendent; Fred Percy Clark, metallurgical engineer; Louis Roberts, smelter superintendent; R. H. Clary, ore buyer; Geo. K. Perrin, mill foreman.

Smelter site is 100 acres and the works are of 350 tons daily capacity, having one 250-ton water-jacket blast-furnace and one 100-ton reverberatory furnace. Product will be a 60% matte. The works also have a complete sampling mill and are served by the main lines of the Southern Pacific and El Paso & Southwestern railways, and it is expected that the Santa Fé line will build to Benson during 1905, giving the plant an exceptionally good location for custom business. Fuel is petroleum of 16° Beaumé, costing 3 cents per gallon, delivered, and coke at \$10 per ton.

SOUTHWESTERN SMELTING CO.**CALIFORNIA.**

Letter returned unclaimed from works office, Oro Grande, San Ber-

nardino Co., Cal. Said to have bought the 80-ton water-jacket smelter of the Davis Mining & Smelting Co., circa July, 1903.

SOVEREIGN COPPER MINING CO.

WYOMING.

Letter returned unclaimed from Battle, Carbon Co., Wyo.

J. SOWELL & CO.

OREGON.

Mine office: Althouse, Josephine Co., Ore. Lands, sundry copper claims, slightly developed by tunnel.

SPANISH COPPER CO., LTD.

SPAIN.

Offices: 2, Tokenhouse Bldgs., London, E. C., Eng. Mine office: San Vicente, via Paimogo, Huelva, Spain. Registered June 8, 1883, with capitalization £150,000, shares £10 par; issued, £94,260. Chas. A. de Mancha, chairman; Wm. H. Nash and Miguel Yglesias, directors. Lands, 6 claims, area 200 acres, perpetual leasehold, held on an annual rental of £400, also 23 acres miscellaneous lands, in the Paimogo district of Huelva, showing 6 contact veins between porphyry and clay-slate, of which 3 are being developed, these averaging 30' width and 500' length, opened by numerous shafts of 30' to 100' depth and 14 tunnels, longest 1,840', estimated to show 2,500,000 tons of ore, with 100,000 tons blocked out for stoping. Ore is mainly cuprififerous pyrites, said to average about 4% copper, 3 oz. silver and \$2 gold per ton. Mines were first opened by the Phoenicians, reopened 1862, and again in 1901. The Gaudina railroad is 5 miles distant. Property is idle, except for a few men engaged in making cement copper from the mine waters.

SPANISH MINERALS DEVELOPMENT, LTD.

SPAIN.

Offices: 157, Cannon St., London, E. C., Eng. Mine office: Almonáster, Huelva, Spain. J. B. White, chairman; A. Thomas, mine manager; W. E. Hopper, secretary. Capitalization, £100,000. Lands, 476 acres, including the Esperanza, Forzosa and other mines, undergoing development.

SPAR COPPER MINES & TUNNEL CO.

Letter returned unclaimed from former address, P. O. Box 812, Denver, Colo.

SPARONE MINES.

ITALY.

A group of small producers, in Piedmont, Italy.

SPASSKY COPPER MINE, LTD.

SIBERIA.

Registered July 9, 1904, by Arthur Fell, 46, Queen Victoria St., London, E. C., England, with capitalization £300,000, shares £1 par, to take over the Yuspensk mine, Spassky works, etc., in Siberia.

SPECULATOR MINING CO.

MONTANA.

Office and mine: Butte, Silver Bow Co., Mont. Employs about 300 men. John A. Creighton, president; John Dougherty, secretary and general manager; W. W. Wilson, superintendent. Property was the subject of extended litigation, which was decided May 2, 1903, in favor of present company. Lands include the Speculator, Jessie, Adirondack and Edith May claims, all small but rich, and the Miner's Union claim is supposedly under option. Original Speculator was less than 5 acres in area; the Jessie falls but a trifle short of being a full claim of 20 acres. These properties lie near the Anaconda, and while small are rich.

Mine is developed by a 1,600' three-compartment main shaft with 80' steel gallows-frame, sunk in granite and connected with ore bodies by crosscuts, with several winzes, which are practically blind shafts, equipped with cages and 5x8" double cylinder hoist, run by compressed air. Is connected underground with the High Ore, Diamond and Bell mines. Ores average 3% to 5% copper. Surface improvements include a brick and steel boiler and engine house, with four 150-h. p. boilers and a large air-compressor, also a machine shop, smithy, carpenter shop and assay office. Ore is treated at the Washoe, Butte & Boston and Colorado smelters. For the year ending June 1, 1903, the mine produced 29,233 tons of ore, giving gross returns of \$15.03 per ton, with net proceeds of \$106,783.84, and for fiscal year 1904 raised 90,352 tons of ore, yielding \$8.43 per ton, giving net profits of \$223,738.

SPENCE GROUP.**OREGON.**

Office and mine: care of Dr. J. Spence, secretary and general manager, Kirby, Josephine Co., Ore. Lands, 8 claims, area 160 acres, having a 60' shaft and 4 tunnels, longest 700', with about 1,250' of underground openings, showing 3 veins, ranging 3' to 100' in width, carrying malachite, azurite and chalcopyrite, giving 2% to 60% copper, with fair gold and silver values, in cuprite. Management intends continuing a 200' tunnel 1,200' further, to crosscut 4 other veins, and plans developing the mines thoroughly and conservatively before erecting reduction works.

SPENCE MINERAL CO.**CALIFORNIA.**

Office: San Francisco, Cal. Mine office: Spenceville, Nevada Co., Cal. Chas. W. Howard, Jr., general manager. Is one of the oldest mines in the state, operating quite steadily since 1875. Ores are auriferous and argentiferous sulphides, averaging about 5% copper and 45% to 50% sulphur, occurring in wide, irregular fissures, near the contact of diorite and granodiorite. Main shaft caved in, 1903.

SPITZEE GOLD MINES, LTD.**BRITISH COLUMBIA.**

Mine office: Rossland, Yale district, B. C. Lands, 4 claims, on which 950' of development work was done in 1904, when 990 tons of ore were produced. Total shipments to end of 1904 were about 2,000 tons of \$12 average value, ores carrying about 1.5% copper and a little silver, with good gold values. Mine is said to show about 3,000 tons of ore. Has electric hoist and pumps, and 5-drill electric Rand air-compressor.

SPOKANE COPPER CO.**WASHINGTON.**

Letter returned unclaimed from Cle Elum, Kittitas Co., Wash.

SPOKANE MINE.**WASHINGTON**

Mine office: Twisp, Wash. Ores carry gold, silver and copper. Has water power and 10-stamp mill.

SPONDULIX MINE.**COLORADO.**

Mine office: Granite, Chaffee Co., Colo. A. D. Bullis, owner; B. H. Pelton, superintendent, at last accounts. Has auriferous and argentiferous copper ores, opened by shaft.

SPRINGDALE COPPER MINING CO.**OREGON.**

Mine office: Athena, Umatilla Co., Oregon.

SPRINGFIELD GOLD & COPPER MINING CO., LTD.**IDAHO.**

Office and mine: 720 Bank St., Wallace, Shoshone Co., Idaho. Capitalization \$100,000, shares 10c. par. Wm. Lively, president; D. A. McKenzie, vice-president and manager; Jos. T. Whelan, secretary. Lands, 4 patented claims, area 80 acres, well timbered, in the St. Joe district, showing 2 fissure veins, opened by about 1,100' of tunnels, longest 860', showing a 13' vein of ore carrying estimated values of \$22 per ton.

SPRINGFIELD MINE.**MARYLAND.**

An old and idle property in Carroll county, Maryland.

SPRINGFIELD-MEXICAN MINING CO.**MEXICO.**

Office: 213½ South Sixth St., Springfield, Ill. Mine office: Union de Tula, Jalisco, Mex. Employs 30 men. Geo. F. Stericker, president; Geo. M. Morgan, vice-president and general manager; E. A. Walsh, secretary; Alfred Orendorff, treasurer; Gerald G. Hereford, superintendent. Organized June 3, 1903, under laws of Arizona, with capitalization \$500,000, shares \$1 par; issued, \$420,000. Lands, 25 pertenencias, area 62 acres, in the Ameca district. Veins are 7 fissures in porphyry, of which one, averaging 4' width, is developed by shafts of 50', 86', 157' and 191' and by tunnels of 80', 198' and 258', giving ore assaying 8% to 10% copper and 12 oz. to 18 oz. silver per ton, with traces of gold. Property is an antigua, closed 1821 and reopened 1901. Has shipped a little high-grade ore to the National Metal Co., at Guadalajara and Ameca.

SPRING GULCH GOLD MINING CO.**COLORADO.**

Mine office: Idaho Springs, Clear Creek Co., Colo. J. B. MacFarlane, superintendent. Operates the Banty group, carrying auriferous and cupriferos silver-lead ores. Has gasoline power.

STADTBERGER HÜTTE ACTIEN GESELLSCHAFT.**GERMANY.**

Office: care of Otto Meurer, president, Köln, Germany. Mine office: Marsberg, Westfalen, Germany. Capitalization, 2,250,000 marks. Obersteiger Spiess, manager. Was formerly known as Stadtberger Gewerkschaft, working since A. D. 1150. Has 3 mines, the Minna and Friederike, active, and the Oscar, idle. Plant includes concentrator and smelter. New deep shafts are being sunk at all three of the mines. Production is about 1,750,000 lbs. refined copper yearly, made from about 45,000 tons of ore, giving an average of about 1.8% copper recovered from ores treated. Employs about 450 men.

STANDARD CONSOLIDATED MINES CO.**OREGON.**

Office: Sumpter, Ore. Mine office: John Day, Grant Co., Ore. Organized May, 1903, under laws of Arizona, with capitalization \$5,000,000, shares \$1 par. Zoath C. Hauser, president and general manager; Edw. W. Mueller, secretary; C. B. Wade, treasurer. Lands, 26 claims, area circa 500 acres, on both sides of Dixie Creek, in the Quartzburg district, showing about 4,200' of development work. Ores carry gold and copper.

STANDARD CONSOLIDATED COPPER CO.**ARIZONA.**

Office: 10 P. O. Sq., Boston, Mass. Mine office: Clifton, Graham Co., Ariz. Organized 1903, under laws of Maine, with capitalization \$1,500,000,

shares \$10 par. C. A. Ross, president; Geo. C. Gill, vice-president; J. W. Hazen, treasurer; John K. Erskine, Jr., secretary; Arthur P. Ayling, general manager; H. L. Martyr, assistant superintendent. Company was formed as a merger of the Coronado Mining Co., Standard Copper Mines, and San José mines, all small properties located near Clifton, with considerable ore bodies developed, and with prospects of becoming important producers.

Lands are in 4 groups, all more or less contiguous, on Chase Creek, on the line of the Coronado railroad, 5 to 6 miles north of Clifton. These lands include the Standard and Coronado groups, 12 claims, in process of patenting, the San José group, 3 claims, and the Copper Center group, 8 claims, in process of patenting, giving total holdings of 23 claims, area circa 400 acres. As the groups are contiguous, or nearly so, the company controls both sides of the gulch of Chase Creek from one to one and a half miles.

The Standard mine is developed extensively by open-cast workings and has about one mile of underground openings on a vein of 2' to 4' width, giving very rich ores ranging 16.5% to 51% in copper tenor, by actual smelter returns, with an average of 25% to 30%, and with considerable ore running 40% to 50% copper.

Ore is carried from the mine to the Coronado railroad by a 3,200' Leschen aerial tram with a drop of 800', operated by gravity, which transports ore at a cost of about 5 cents per ton, as against a former cost of about \$2 per ton, when shipped by burros. Tram-line has shipping bins at the lower terminus, opposite the railroad track. The mine uses gasoline power.

The San José group shows a 4' to 5' vein of very rich chalcocite, slightly developed. Work on the Copper Center group was started December, 1904. Ores formerly were reduced at the Shannon smelter, but shipments were discontinued at the close of 1904, and failing a renewal of smelting contract with the Shannon on more satisfactory terms, Standard ores will go to the works of the Arizona Copper Co. for reduction. Production for 1904 probably was about 1,500,000 lbs. fine copper. The Standard is a well managed property of exceptional promise.

STANDARD COPPER CO.

ARIZONA.

Said to have 7 claims, 13 miles from Casa Grande, Pinal county, Arizona.

STANDARD COPPER MINES.

ARIZONA.

Mine office: Clifton, Graham Co., Ariz. Capitalization \$500,000, shares \$1 par. Control is held, through ownership of majority of stock, by the Standard Consolidated Copper Co., which operates the property.

STANDARD COPPER MINING CO.

WYOMING.

Office: Toledo, Ohio. Mine office: Battle, Carbon Co., Wyo. Chas. P. Waldorf, president. Property is the Susquehanna group, which was being prospected by a small force, during 1904.

STANDARD GOLD & COPPER MINING CO.

OREGON.

Absorbed by Standard Consolidated Mines Co.

STAR CONSOLIDATED MINING CO.

UTAH.

Mine office: Eureka, Juab Co., Utah. Ores carry gold, silver and copper. Has steam power and employed about 30 men at last accounts.

STAR COPPER MINING CO.**MICHIGAN.**

Lands, 720 acres, in Sections 9-10-16, 58-28, Keewenaw county, Michigan.

STARLIGHT MINE.**ARIZONA.**

Owned and operated by Tri-Bullion Smelting & Development Co.

STARLUS COPPER-GOLD MINING CO.

Letter returned unclaimed from former office, Chicago, Ills.

STATE LINE COPPER MINING CO.**WYOMING.**

Office: 300 Century Bldg., Denver, Colo. Organized under laws of Wyoming, with capitalization \$75,000, shares 5 cents par. C. B. Ayres, president; W. W. Wemott, secretary and treasurer; J. B. Drew, superintendent. Lands, 17 claims, area 340 acres, in the Upper Platte district, showing 4 fissure veins, of which two range from 2' to 40' in width, these being opened by 17 pits and shafts of 10' to 60' depth.

STAUFFER CHEMICAL CO.**CALIFORNIA.**

Office: San Francisco, Cal. Property is 80 acres, known as the Alma mine, near Oakland, Alameda Co., Cal., developed mainly by tunnels. Ore is chalcopyrite, ranging from 1.5% to 3.5% copper, up to 50% sulphur and about \$2.50 gold per ton, occurring in lenses between serpentine and metamorphosed chert, in a belt traced 3,000'. After burning for sulphur the cinder is leached for copper.

STEAMBOAT MINING CO.**UTAH.**

Mine office: Brighton, Salt Lake, Co., Utah Has a tunnel.

STEPHENS CLAIMS.**MONTANA.**

Office and mine: care of W. J. Stephens, owner, Higgins Blk., Missoula, Missoula Co., Mont. Lands, 7 patented claims, area 132 acres, known as the Hidden Treasure group, also 320 acres miscellaneous lands, in the Wallace district, showing a 45' vein of concentrating ore and a 30" vein of sulphide shipping bre, latter having given smelter returns of 13% copper, 28 oz. silver and \$5.50 gold per ton. Has shafts of 55' and 149', also tunnels of 45', 105', 525' and 928', with about 2,000' of underground openings, estimated by owner to show about 100,000 tons of ore. Idle.

STEPHENSON-BENNETT CONSOLIDATED MINING CO. NEW MEXICO.

Mine office: Organ, Donna Ana Co., N. M. Ores carry silver, lead and copper. Has steam power and 50-ton concentrator.

STEPTOE MINING CO.**NEVADA.**

Property sold, Sept. 4, 1902, to New York & Nevada Copper Co.

STERLING COPPER CO.**ARIZONA.**

Letter returned unclaimed from former office, 44 Broadway, New York.

STEVENS COPPER CO.**ARIZONA.**

Office: care of Fred Enos, secretary, Bridgeport, Conn. Mine office: Clifton, Graham Co., Ariz. Henry Setzer, president; Chas. H. Hawley, vice-president; Frederic S. Hunt, treasurer; Chas. E. Stevens, superintendent; F. A. Alsdorf, consulting engineer. Has steam power. Lands, 39 claims, area circa 800 acres, about 2 miles from Metcalf. Country rocks are granite, overlaid by Cambrian quartzite and Silurian limestone, with much faulting, and intrusive porphyritic dykes, ores occurring near the fault-lines.

Property is being managed conservatively and is regarded as decidedly promising.

STEVENS PEAK COPPER MINING CO.

IDAHO.

Office: care of A. M. Strode, president and manager, Mullan, Idaho.

STILLAGUAMISH & SULTAN MINING CO.

WASHINGTON.

Office: 606 Bailey Bldg., Seattle, Wash. Mine office: Silverton, Snohomish Co., Wash. Organized September 22, 1892, under laws of Washington, with capitalization \$3,000,000, shares \$50 par. Richard Sykes, president; J. W. Clise, vice-president and general manager; Willis B. Herr, secretary. Lands, 15 claims, area 575 acres, in the Stillaguamish district, with 1,400' of mine openings, showing low-grade auriferous copper ore. Idle.

STILLMAN COPPER MINING CO.

WYOMING.

Office: 408-145 La Salle St., Chicago, Ill. Lands, supposedly are in the Encampment district of Carbon county, Wyoming.

STOBIE MINING CO.

ONTARIO.

Mine office: Desbarats, Algoma, Ont. Organized 1900, under laws of Ontario, with capitalization \$1,000,000, shares \$1 par. James Stobie, president; A. B. Upton, vice-president and general manager; John Lear, secretary and treasurer. Lands, 134 acres, in Block O, Johnson Twp., Algoma, Ont., showing a vein of 3' to 5' carrying chalcocite, bornite and chalcopyrite. A carload of ore, shipped 1901, gave net smelter returns of 18% copper.

STOCKTON COPPER MINING CO.

CALIFORNIA.

Lands, sundry claims in the Burney Valley, near Pitt river, Shasta county, California, said to show auriferous copper ores.

STOCKTON COPPER MINING CO.

COLORADO.

Office: 312 Bank of Commerce Bldg., Minneapolis, Minn. Mine office: Salida, Chaffee Co., Colo. C. T. Bergh, president; J. W. Allan, secretary; A. E. Chilson, manager, Webster, S. D.; Wm. Parker, superintendent. Development is by a 225' tunnel, giving a fair showing of carbonate ore, with occasional native copper.

STOCKTON COPPER MINING CO.

MONTANA.

Mine office: Radersburg, Broadwater Co., Mont. Organized under laws of Montana, with capitalization \$1,000,000. E. W. Harney, president; P. A. Gamer, secretary; John Rathfus, superintendent. Lands include the Idaho claims, in East Butte, and the North Star group, in Broadwater county, the latter having been a limited producer in the past. Property is considered of value, but company was financially embarrassed at last accounts.

STODDARD COPPER CO.

ARIZONA.

Mine office: Stoddard, Yavapai Co., Ariz. Organized under laws of Arizona, with capitalization \$5,000,000, shares \$5 par. Robt. J. Campbell, president; John N. Drake, secretary; Isaac T. Stoddard, general manager; John Martin, superintendent. Lands, 16 claims, developed by sundry shafts, deepest 250' in the Copper Bottom mine, also various tunnels, longest 1,000'. Has secured returns of \$15 to \$26.50 per ton from smelter shipments. Has a concentrator, Huntington mill and 50-ton smelter on the Agua Fria

river. Good carbonate and oxide surface ores were succeeded by a leached zone, but fair grade sulphide ores have been secured at depth. Idle at last accounts, and company short of funds, but property considered promising.

STONE CREEK COPPER MINING & MILLING CO. MONTANA.

Office: 818-109 Randolph St., Chicago, Ill. Mine office: Dillon, Beaverhead Co., Mont. Organized 1901, under laws of Arizona, with capitalization \$1,250,000, shares \$1 par. G. J. M. Porter, president; B. J. Soper, secretary; W. D. Porter, superintendent; A. L. Stone, agent. Lands, 8 claims, area 125 acres, in the Stone Creek district, showing malachite, azurite and low-grade copper outcrops. Has a 60' two-compartment main shaft and 5 shallow pits, also a 130' tunnel.

STONE HILL COPPER MINES.

ALABAMA.

An idle property, once worked extensively, at Cleburne, Alabama.

STONEWALL COPPER CO.

ARIZONA.

A swindle, perpetrated by the notorious Wernse gang of St. Louis.

SANTIAGO STOPELLI

MEXICO.

Mine office: Jiménez, Chihuahua, Mexico.

STORA KOPPARBERG BERSLAGS AKTIEBOLAG.

SWEDEN.

Office, mines and works: Falun, Dalarne, Sweden. Capitalization, 9,600,000 kroner; shares 1,000 kroner par. E. J. Ljungberg, director; Lars Yngström, assistant director and general manager. Th. Witt, mining engineer; K. A. Akerblom, superintendent of leaching plant. Lands, 5 claims, 3 patented and 2 unpatented, area 43 hectares. Mine was worked as early as A. D. 1288 and presumably earlier, oldest privileges of the present company being dated Feb. 24, 1347. Company conducts extensive industrial operations, owning and operating iron and steel plants, a paper mill, pulp mill, sawmill, etc., in addition to its copper mines and smelters. Has a number of lenses of ore, the largest being of immense size. Has several mines and many ore bodies, principal being the Storrgrufa, 370 metres long by 220 metres wide and about 320 metres deep, mostly mined out, leaving an open pit about 220' deep. Ore is chalcopyrite, containing selenium and bismuth, giving average returns of 2.7% to 3% copper, 10 to 15 grams silver and 2.5 to 3 grams gold per ton. Has 14 shafts, with aggregate depth of 1,800 metres, deepest being 343 metres, with about 33 kilometres of tunnels. Has water power. The copper mine employs about 100 men and gives a yearly production of about 43,000 tons of raw ore, which, after hand-cobbing, yields about 14,000 tons of leaching ore. The roasting stalls are one-half kilometre from the mine, and the leaching plant is one-half kilometre beyond the furnaces, all connected by tram-line.

The roasted ore is crushed with salt, re-roasted and leached with dilute sulphuric acid in tanks, the metallic contents of the leach-water being precipitated on scrap iron as cement copper, which is dissolved in sulphuric acid and turned out as bluestone. Annual production is about 1,250 metric tons of sulphate of copper, equal to about 300 tons of fine copper, 300 kilograms of silver and 80 kilograms of gold.

STORRGRUFA MINE.

SWEDEN.

Owned and operated by Stora Kopparberg Berslags Aktiebolag.

STOWELL MINE.**CALIFORNIA.**

Office: care of J. H. Stowell, owner, Copley, Shasta Co., Cal. Sometimes known as Webster Consolidated. Lands, 10 claims, opened by a series of short crosscut tunnels, none of which have cut the vein.

STRATHCONA MINE.**ONTARIO.**

Office: care of J. F. Black, owner, Sudbury, Algoma, Ont. Lands, in Levack Twp., slightly developed, show copper-nickel sulphides.

STRICKLEY-MONTEZUMA MINING CO.**UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. W. J. Strickley, superintendent. Has auriferous copper ores, and steam power.

STRONG-COPPER CLAIMS CO.**OREGON.**

Lands sold to Waldo Smelting & Mining Co.

STRONG COPPER MINING CO.**WYOMING.**

Office: 210 Grant Ave., Laramie, Wyo. Employs 11 men. Organized June 12, 1903, under laws of Wyoming, with capitalization \$1,000,000, shares \$1 par. N. E. Corthell, president; I. R. Swigart, secretary, treasurer and general manager. Lands, 16 claims, area 270 acres, in Section 4, Town 16, Range 71, Albany county, Wyoming, showing a fissure vein in pegmatite, and contact veins between granite and limestone, of which one, with average width of 7', is opened by a 170' shaft and 3 short tunnels, longest 45', giving average assays of 4% copper, 3 oz. silver and \$3.60 gold per ton, with some lead and molybdenite, from malachite, chalcocite, bornite and chalcopyrite. Is opened by about 20 shallow pits and a 260' shaft, with 520' of underground openings estimated to show 10,000 tons of ore. Has a 25-h. p. steam hoist and plans building a concentrator.

DAVID A. STUART.**PERU.**

Office and mine: Quicachaca, Yauyos, Peru. Is a small producer of copper, silver, lead and coal.

SUCCESS COPPER MINING CO.**ARIZONA.**

Office: 536 Douglas Bldg., Los Angeles, Cal. Mine office: Quartzite, Yuma Co., Ariz. Employs 10 men. Organized 1902, under laws of Arizona, with capitalization \$750,000, shares \$1 par. Chas. E. Eichelberger, president; Robert Marsh, secretary and treasurer; John A. River, superintendent. Lands, 6 claims, area 124 acres, in the Plomosa district, showing 5 contact veins, 2 of 12' average width, carrying oxide and carbonate ores giving average assays of 15% copper, 40 oz. silver and \$3 gold per ton. Has shafts of 60', 75', 115', and 250', also a 300' tunnel, with 1,700' of underground openings. Has steam power and plans installing a 50-ton smelter.

EL SUEÑO MINING CO.**MEXICO.**

This company, having lands somewhere in the northern district of Baja California, Mexico, has a small smelter, known as El Cueros de Venado, and made 669 kgs. copper in 1903.

SUGAR LOAF MINING CO.**SOUTH DAKOTA.**

Mine office: Custer, Custer Co., S. D. Said to be controlled by Drake, Barnes & Co., of Cleveland, Ohio. Has shipped some fluxing ore to the Deadwood smelter, from the Richard Palmer mine.

SUGAR PINE MINE.**OREGON.**

Office: care of G. N. Bolt, owner, Galice, Josephine Co., Ore. Ores carry gold, silver, copper and lead. Has water and gasoline power, and 4-stamp mill

SULITELMA AKTIEBOLAG.**NORWAY.**

Office: Helsingborg, Sweden. Mine office: Sulitjelma, Nordland, Norway. Employs 1,300 men. Organized 1890, under laws of Sweden, with capitalization 3,000,000 kroner, shares 500 kroner par, fully paid. Has paid dividends of 32% on capitalization, to end of 1904. Annual meeting in May. Lieutenant-Governor G. Tornerhjelm, president; Consul Nils Persson, vice-president; Emil Knudsen, general manager; Sture P. Henning, assistant general manager; preceding officers, C. Ingelsson, August Sylvan, Thure Røing, R. M. B. Schjölberg, C. E. Hedström and Prof. Hjalmar Sjögren, directors; A. O. Anfindsen, superintendent; Fredrik Carlson, mine superintendent; Andreas Quale, mill superintendent; Hans Dyck, smelter superintendent; Ole A. Bachke, engineer. Lands, about 100,000 acres, in the Skjerstad district, lying north of the Arctic circle, and including the Sulitjelma, Charlotta and Giken groups. Property was opened in 1892 and has become the principal copper producer of Norway. The Sulitjelma company also owns the Altens group of copper mines.

Country rock is micaceous schists of lower Silurian age, with eruptive flows of greenstone conformable with schists, ore bodies occurring as extended lenses, very persistent in strike and depth, on the contact of the schists with metamorphosed amphibolite and olivine gabbro, lenses dipping from 15° to 40° with the horizon. Ore is exclusively cupriferous iron pyrites, averaging 4% copper and 45% sulphur, with small quantities of nickel. There are 16 known lenses on the company's lands, of which 8 are undergoing development, these averaging about 5 metres width by two miles length.

Development is by 6 shafts and 9 tunnels, with 12,747 metres of underground openings, estimated to show 2,656,000 tons of ore, of which 574,000 tons are blocked out for stoping. Depths of shafts were as follows at close of 1904: Hanka-bakken, 292 metres; Nya, 493 m.; Sulitjelma, 345 m.; Giken 855 m.; Charlotta, 360 m.; Tornerhjelm, 164 m. Names and lengths of tunnels were as follows at end of 1904: Ny-Sulitjelma, 398 metres, with 2,108 metres of drifts; Hanka-bakken, 68 m. with 393 m. drifts; Giken, 1518 m. with 2,218 m. drifts; Charlotta, 520 m. with 2,677 m. drifts; Måns-Petter, 175 m. with 218 m. drifts; Bursi, 44 m. with 475 m. drifts; Koch, 131 m. with 351 m. drifts; Tornerhjelm, 145 m. with 320 m. drifts; also sundry short tunnels aggregating 647 metres, with 341 metres of drifts.

The mine has 190 h. p., the mill 370 h. p. and the smelter 273 h. p. Power available is 52 h. p. from steam, 500 h. p. from electricity and 1,260 h. p. from water. The mines have 6 hoists, 1 Ingersoll-Sergeant, 1 Burchard and 3 Schramm air-compressors, with an aggregate capacity of 28 drills, and 19 power drills are used. The mine buildings are of wood, the machine shop having an area of 380 square metres; carpenter shop, 300 sq. m.; smithy, 600 sq. m. There is an extensive system of aerial tramways with 15 stations and 2 power stations. The company also owns 132 dwellings.

The concentrator, of wood, area 2,000 square metres, has 4 Blake crushers, 8 trains of rolls, 42 Hartz jigs and 19 slime tables, with a daily capacity of about 900 tons. The smelter, at Fagerlid, $1\frac{1}{2}$ to 3 miles from the mines, receives ore therefrom by aerial trams, and has a daily capacity of 140 tons. Equipment includes three 30-ton 36" water-jacket blast furnaces, one 50-ton pyritic smelting converter of the Knudsen type, and one converter stand with 8 shells taking 7.5 metric ton charges each. Product of first fusion is a matte of 30% to 40% copper tenor, and final product is a 99.25% blister copper, sent to the Helsingborg Copper Works, at Helsingborg, Sweden, for refining. There also is a leaching plant in connection with the Helsingborg works.

Miscellaneous enterprises of the Sulitelma include 2 sawmills, one general store, 7 steamers, 35 barges, a church, school and Good Templar's lodge. A private railroad, known as the Sulitjelmabanen, length 13 kilometres, has 3 locomotives and 78 cars. Fuel costs are 5 kroner per cord for wood 21 kroner per ton for soft coal and 30 kroner per ton for coke, annual consumption being about 4,000 cords of wood, 3,000 tons of soft coal and 2,600 tons of coke. Average mining costs are 7.86 kroner per metric ton, concentrating costs 2.59 kroner, smelting and converting 16.41 kroner, and cost of blister copper is about 600 kroner per metric ton. Ores are divided into two classes, the first grade, or smelting ore, carrying 4% to 8% copper, while the second grade, for export, carries 1.5% to 4% copper, and an average of 45% sulphur 34% to 36% iron and 2% to 2.5% alumina. Average tenor of all ores is about 4% copper and 45% sulphur. Gross ore production is about 90,000 tons yearly, and of the sulphur ore exported, about half is fines and half lumps, sent to Helsingborg, Riga, Antwerp, Ghent and various ports in Great Britain. Exports for 1904 were 63,300 tons of sulphur ore averaging 4% in copper tenor. Production in 1904 was 602 metric tons of blister copper and 2,532 tons exported, in addition to which the Altens mine exported ores carrying 320 tons of fine copper, giving a gross production of 3,454 metric tons equal to 7,614,688 lbs. fine copper.

The Sulitelma is a very valuable property, and enjoys the possession of an intelligent and highly progressive management.

SULLIVAN GOLD & COPPER MINING CO..

MONTANA.

Said to have claims near Kalispell, Flathead Co., Montana.

SULPHIDE COPPER CO.

COLORADO.

Office: care of J. C. Lewis, president, P. O. box 358, Denver, Colo. Lands, sundry claims in the Rock Creek district of Gunnison county, Colorado, said to show argentiferous copper sulphides.

SUMAS MINING CO.

WASHINGTON.

Mine office: Sumas, Whatcom Co., Wash. W. W. Jones, president; Mrs. M. Record, secretary. Lands, sundry claims near the head of Swamp Creek, showing auriferous copper ores.

SUMITOMO COPPER CO.

JAPAN.

Office: Osaka, Japan. Mine office: Niihama, Iyo, Japan. Kichizaemon Sumitomo, president; Kinkichi Nakada, general manager; Tsuruzo Koike and Jozo Sugiura, assistant managers. Operates the Beashi mine the

second largest copper producer of the empire, located in the province of Iyo, on the island of Shikoku, Japan. This mine was opened, in 1690, by the Sumitomo family, in whose capable hands it remains. The production was upwards of 3,000,000 pounds annually as early as the close of the Seventeenth Century.

Ore is chalcopryite, associated with large quantities of iron pyrites and small proportions of lead, cobalt, manganese and arsenic, the ore averaging about 6% in copper. The vein varies in width from 4' to 30', averaging about 10' to 20' and has been developed to a length of about 6,000'. The vein occurs in alternating layers of chloritic and graphitic schists, each enveloped by a quartz schist, known locally as "habu," with a dip of 45° N. E., with interstratifications of piedmontite schist. Step-faults, running nearly parallel from east to west, occur among these, giving throws of 10' to 20' and sometimes as much as 60'. The mine has water and electric power and a 200-ton smelter. The equipment is excellent throughout, being thoroughly modern in every respect. Several thousand men and boys are employed in and about the mine and smelter. Production was 8,000,249 lbs. of refined copper in 1900, and about 11,000,000 lbs. in 1904.

SUMMIT MINE.**ARIZONA.**

Office: Globe, Gila Co., Ariz. Mine, about 15 miles from Globe, is a fissure vein in Pinal schists, vein ranging 2' and upwards in width, with several smaller parallel veins or "streaks" on the footwall side. Ore is mainly massive chalcopryite and bornite, coated with chalcocite. Mine is opened by tunnel, and since August, 1904, has made monthly net smelter shipments of \$8,000 to \$14,000 to the Old Dominion smelter.

SUMMIT MINING & MILLING CO.**WASHINGTON.**

Office: Davenport, Wash. Mine office: Keller, Ferry Co., Wash. C. H. Neal, president; C. A. Gray, secretary; A. R. Alexander, superintendent. Has a 100' shaft, showing argentiferous and slightly auriferous copper ore, giving assays of about \$60 per ton.

SUN-ANCHOR MINING CO.**WYOMING.**

Mine office: Encampment, Carbon Co., Wyo. Capitalization \$1,000,000. L. W. Tennant, president; Geo. Kuntzmann, secretary and treasurer. Lands, 3 claims.

SUN & MOON MINING & MILLING CO.**COLORADO.**

Mine office: Idaho Springs, Clear Creek Co., Colo. M. M. Simms, manager. Ores carry gold, silver, lead and copper. Has steam and electric power and employed about 100 men at last accounts.

C. & J. SUNDHEIM (SOCIEDAD REGULAR COLECTIVA.)**SPAIN.**

Office: Huelva, Spain. Is an incorporated co-partnership between Don Carlos Sundheim de la Cueva and Doña Justa Sundheim de la Cueva. William Guthrie Bowie, manager. Property includes the Cabezas del Pasto mines.

SUNDOWN MINE.**ARIZONA.**

Mine office: Globe, Gila Co., Ariz. L. C. Woods, superintendent.

SUNLIGHT MINING & MILLING CO.**COLORADO.**

Letter returned unclaimed from Eureka, San Juan Co., Colo.

SUNNY CORNER SILVER MINING CO.**AUSTRALIA.**

In the Sunny Corner division of New South Wales, Australia. Secures a little copper as a by-product from silver ores, having made 38 tons of copper from 3,814 tons of ore smelted in 1901.

SUNNYSIDE COPPER MINING CO.**WYOMING.**

Letter returned unclaimed from Riverside, Carbon Co., Wyo.

SUNRISE COPPER CO.**WYOMING.**

Mine office: Sunrise, Wyo. Organized September, 1902, under laws of Wyoming. O. L. Vincent, president; H. P. Jarrad, secretary. Lands, about 11 miles from Sunrise, were worked originally for iron ore. The copper ores carry gold and silver values.

SUNSET COPPER CO., LTD.**BRITISH COLUMBIA.**

Mine office: Princeton, Yale district, B. C.

SUNSET COPPER MINING CO.**WASHINGTON.**

Office: Colvin Bldg., Glens Falls, N. Y. Mine office: Index, Snohomish Co., Wash. Organized 1897, under laws of Washington, with capitalization \$3,000,000, shares \$1 par. Addison B. Colvin, president; Paris D. Russell, secretary and treasurer; Hon. John C. Denny, chairman of executive committee; W. W. Black, general manager; Geo. C. Clark, superintendent. Lands, 23 claims, area 460 acres, also a 20-acre millsite and sundry water-rights, opposite the Ethel mine. Thomas Garrigues, receiver, was discharged, October, 1904, upon payment of company's debts, of about \$5,000, by M. W. Bell, of Glens Falls, N. Y. Mine is very fully described in Vol. IV.

SUNSET GROUP.**BRITISH COLUMBIA.**

Seven claims, near Brown's Bay, above Seymour Narrows, Vancouver Island, B. C. Ores are chalcopryite and bornite, with quartz gangue, traversing an amygdaloidal diabase.

SUPERIOR COPPER CO.**ARIZONA.**

Office: 20 Broad St., New York. Letter returned unclaimed from former mine office, Tucson, Pima Co., Ariz. Organized under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. T. B. Mills, president; W. L. Mercer, secretary; B. S. Coffman, general superintendent. Lands, 10 claims, area 200 acres, 26 miles south of Tucson, with a shallow shaft, showing ores giving average assays of 6% copper and \$5 to \$18 gold per ton.

SUPERIOR COPPER CO.**MICHIGAN.**

Office and mine: Houghton, Houghton Co., Mich. Organized July 23, 1904, under laws of Michigan, with capitalization \$2,500,000, shares \$25 par, issued, \$1,500,000. Reginald C. Pryor, president; R. Skiff Shelden, vice-president; Jas. P. Edwards, secretary; Courtney C. Douglass, treasurer; preceding officers and John H. Rice, directors; Wm. Wearne, mining captain. Lands, 400 acres, in Sec. 15, Town 54 North, Range 34 West. Lands lie next north of the Baltic mine, and carry the northern extension of the Baltic amygdaloid, which has been exposed at three points by trenches cut at intervals of about 1,000'. A shaft on the lode was 90' deep at the close of 1904, and drifts were started both north and south on the lode, which is

about 45' wide, at this depth, as determined by the trenching on surface and by a crosscut sent to the hanging-wall on the 90' level. The equipment is temporary only, including headgear, small hoist, boiler and air-compressor.

The Baltic lode, where opened by the Superior, shows fair stamp-rock and occasional heavy copper. Near surface carbonate stains are much in evidence throughout the lode. The rock is somewhat deceptive in appearance, much of the rock apparently barren of metal showing well in stamp-copper when broken. The Superior is a property of unusual promise and, with development, should make another fine mine of the Baltic family.

SUPERIOR COPPER CO., LTD.

ONTARIO.

Office: Sault Ste Marie, Ont. Mine office: Superior Mine, via Algoma Central Ry., Algoma, Ont. Organized September 13, 1901, under laws of Ontario, with capitalization \$1,500,000, increased, 1903, to \$2,000,000, shares \$10 par; issued, \$1,440,000. Frank Perry, president; E. L. Fisher, vice-president; W. A. Madison, secretary and superintendent; George Kemp, treasurer; preceding officers, W. L. Martin, H. B. Hanger, J. A. Culbeck, W. H. Teare and Geo. W. Nicholson, directors; P. A. Derry, mining captain. Lands, 8 crown-granted claims, area 680 acres, in an unorganized district of Algoma, showing 2 fissure veins, in country rocks of granite and green chloritic schists, with average strike N. 43° W., and dip of 70° to the southwest. First vein averages 20' in width, and second about 70' width, these being traceable about 8,000', with about 1,000' uncovered on the smaller vein, and nearly a mile stripped on the larger vein. Development is by about 20 pits and trenches and by shafts of 100', 154', 100', 40', 100', and 260', with a total of 1,050' of underground openings, estimated to show 500,000 tons of ore, with 134,000 tons blocked out for stoping. Ores are chalcopryite, bornite and chalcocite, with quartz gangue, carrying estimated average values of 3% copper, 1 oz. silver and \$2.50 gold per ton. Has a 120-h. p. steam plant, with one-half of a 12-drill Ingersoll-Sergeant air-compressor, 2 hoists, 5 power drills, engine-house, smithy, changing-house, boarding-house and 7 dwellings. Fuel is wood, costing \$1.25 per cord. Considerable good ore has been stocked at the shafts. Work was suspended August, 1904, and it is not planned to resume mining until a concentrator is built, to permit mine to pay at least a part of the cost of development by production. Management is good and property is considered promising.

SUPERIOR COPPER & GOLD MINING CO.

Office: 64 East Second St., Salt Lake City, Utah.

SUPERIOR MINING CO.

NEW MEXICO.

Letter returned unclaimed from former mine office, Cerillos, Santa Fé Co., N. M.

SUPERIOR MINING CO.

WASHINGTON.

Office: 1529 Tower Ave, West Superior, Wis. Letter returned unclaimed from former mine office, Berlin, King Co., Wash. Organized 1902, under laws of Washington, with capitalization \$2,000,000, shares \$1 par. J. P. Simon, president and treasurer; B. A. Baerlocher, secretary and superintendent. Lands, 4 claims, area 82 acres, in the Miller River district, showing

an 8' fissure vein, opened by a 125' tunnel, giving carbonate and sulphide copper ores, associated with galena, assaying 6% copper, 7 oz. silver and \$1 to \$30 gold per ton. Company is endeavoring to raise funds for resumption of mining.

SUPERIOR-ALTA MINING CO.**UTAH.**

Office: care of Walter L. Maas, secretary and manager, Salt Lake City, Utah. Mine office: Alta, Salt Lake Co., Utah. J. A. Jacobson, president; L. A. Jeffs, vice-president. Capitalization \$300,000, shares \$1 par.

SURE THING COPPER MINING & SMELTING CO.**WASHINGTON.**

Office: 116 Ninth St., Tacoma, Wash. Mine office: North Bend, King Co., Wash. Organized November, 1901, under laws of Washington, with capitalization \$2,500,000, shares \$1 par. G. W. Owens, president; Joseph Watson, superintendent. Lands, 7 claims, area 145 acres, also millsite and 1,500 acres miscellaneous lands, in the Burns district, showing about 20 veins, from 2' upward in width, reported by company to carry 8% to 30% copper, up to 80% lead, 75 oz. silver and \$25 gold per ton. Has 3 shallow shafts and 5 tunnels, longest 500'.

SUSQUEHANNA GOLD MINING CO.**BRITISH COLUMBIA.**

Mine office: Hall, Yale & Cariboo district, B. C. T. Elwin, Supt.

SWAKOPMUNDER MINEN-GESELLSCHAFT.**GERMAN SOUTHWEST AFRICA.**

Office: Schellingstrasse 4, Berlin, W9, Germany. Mine office: Corob, via Swakopmund, German S. W. Africa. Capitalization 36,000 marks. Property is sundry mineral concessions in German Southwest Africa, with copper prospects partially developed, work probably suspended at present, owing to rebellion of the Herreros.

SWEDEN GROUP.**WASHINGTON.**

Sold to Mount St. Helen's Consolidated Mining Co.

SWINDLER MINE.**ARIZONA.**

Owned and operated by Huron Gold Co.

SWISHELM DEVELOPMENT CO.**ARIZONA.**

Lands, 40 claims, in the Swishelm Mountains, Cochise Co., Ariz.

SWISS GIRL MINING CO.**ARIZONA.**

Lands sold to Baumann Copper Co.

SYLVANIA MINE.**NEVADA.**

Mine office: Bullion, Elko Co., Nev. F. J. Frank, superintendent. Vein carries a 6' pay-streak from which about 1,000 tons have been shipped.

TABLAS-FINANA COPPER CO., LTD.**SPAIN.**

Voluntarily wound up, December, 1901.

TABLE MOUNTAIN COPPER CO.**ARIZONA.**

Letters returned unclaimed from Kelvin, Pinal Co., Ariz.

TACOMA COMPANY.**BRITISH COLUMBIA & WASHINGTON.**

Office: Tacoma, Wash. Mine office: Van Anda, Texada Island, B. C. Lands include 640 acres, crown-granted, carrying gold and iron ore, on Texada Island, B. C., also the Marble Bay mine, on Texada Island, 4,000 acres of coking-coal lands in Washington, 208 acres of iron ore lands on Redonda

Island, B. C., a gold-copper mine at Darrington, Snohomish county, Washington, and 7,000 acres of Washington timber lands. Principal copper property is the Marble Bay mine, about a quarter mile from the Van Anda, with similar occurrence and character of ore. Price of mine, \$200,000, is said to have been paid from ore extracted 1902-1904. Ore shipments were 6,370 tons in 1902 and about 15,000 tons in 1903. Ore has been shipped to various points, but latterly has gone to Tacoma solely. The Marble Bay mine has a 600' main shaft, with values holding, if not increasing, at depth. Ores are slightly auriferous and argentiferous bornite and chalcopyrite, averaging perhaps 5% to 6% copper, 2 oz. silver and \$1 gold per ton. Has steam power and 150-ton concentrator, with shipping wharves and ore-bunkers on Sturt Bay, connected with mine by a 2,125' aerial tram.

TACOMA SMELTING CO.**WASHINGTON.**

Office and works: Tacoma, Pierce Co., Wash. W. R. Rust, general manager; F. W. Clark, superintendent. Employs about 250 men. Paid quarterly dividends of $2\frac{1}{2}\%$ in 1903, and is said to have a cash working capital of about \$300,000, in addition to a plant costing about \$400,000. Lands include an extensive and well-located site on tidal water, flats being reclaimed by filling in with slag. Has extensive wharves, with ore bunkers and automatic devices for unloading cargoes, a small electric tram-line connecting the wharves and all parts of the works. The smelting plant includes 4 lead stacks, 100-ton blast-furnaces, with 3 Connorsville blowers driven by a 200-h. p. Westinghouse induction motor. The copper smelter includes three 60-ton mechanical roasters and two 10-ton hand-roasters, in addition to which ores are heap-roasted. The copper stack is a 42x160" 400-ton water-jacket blast-furnace with forehearth 14' in diameter and 48" high, holding 60 tons of molten matte. A 36" cupola resmelting furnace, with outside settler, can treat 75 tons of 50% matte daily. The converter department has 2 stands and 6 barrel-type shells of 72x100", and a 30-ton electric crane. Management is progressive and metallurgical practice is good.

TACOMA STEEL CO.**WASHINGTON.**

See the Tacoma Company.

TADERGOUNT COPPER MINE.**ALGERIA.**

An Algerian property, location uncertain, but possibly Tadgemount, on the headwaters of the Jedi river, Amour Mountains, which shipped 200 tons of copper ore in 1901.

TAKILMA SMELTING CO.**OREGON.**

Office: P. O. Box 1487, Colorado Springs, Colo. Works office: Takilma, Josephine Co., Ore. Organized under laws of Colorado, with capitalization \$250,000. Chas. L. Tutt, general manager; E. W. Walters, superintendent. Is located 42 miles from Grant's Pass, the nearest railway point, and has a plant with one water-jacket matting furnace of about 125 tons daily capacity, blown in September 8, 1904. Also has a small sawmill. Management and ownership practically the same as of the Waldo Smelting & Mining Co., smelter having been built to treat ores of the Waldo. Management is composed of men experienced and successful in mining and reduction.

TAM O'SHANTER MINE.**NEVADA.**

Mine office: Sandy, Lincoln Co., Nev. J. R. Newberry, owner. Idle.

TAMARACK JUNIOR MINE.**MICHIGAN.**

Owned by Osceola Consolidated Mining Co. Idle since 1902.

TAMARACK MINING CO.**MICHIGAN.**

Office: 199 Washington St., Boston, Mass. Mine office: Calumet, Houghton Co., Mich. Organized 1882, under laws of Michigan, with capitalization \$1,500,000, shares \$25 par. Annual meeting, first Thursday in May. Albert S. Bigelow, president; W. J. Ladd, secretary and treasurer; Wm. E. Parnall, superintendent; preceding officers, Jos. S. Bigelow, David M. Anthony, Edw. S. Grew and J. Henry Brooks, directors; Wm. J. Uren, assistant superintendent; Thos. Maslin, mining captain; John T. Reeder, clerk; John T. Been, engineer; A. Lincoln Burgan, mill superintendent; H. B. Claussen, master mechanic.

Official returns to the state of Michigan, as of date Jan. 1, 1904, disclose the following figures:

Amount cash paid in on capital stock.....	\$ 580,000.00
Amount paid in by conveyance of property to company..	200,000.00
Entire amount invested in real estate.....	199,486.00
Amount of personal estate.....	1,878,878.70
Amount of unsecured or floating debt, (including advances on copper since paid).....	1,101,847.27
Amount due corporation (included in personal estate)....	681,804.02

The following table gives comparative results for the past two calendar

years:

	1903.	1904.
Tons rock stamped.....	657,920	642,320
Pounds mineral obtained	24,055,512	22,662,070
Pounds fine copper obtained.....	15,286,093	14,961,885
Pounds fine copper per ton stamped	23.2	23.3
Cost of mining and stamping, per ton.	\$2.32	\$2.42
Cost of stamping, per ton, cents.....	.2624	.2603
Cost per pound fine copper, cents	.1150	.1298

Dividends to close of 1904 were \$3,580,000 of which \$90,000 was paid in 1904, this dividend, of \$1.50 per share, being the first since 1901, in which year two \$10 dividends were paid.

Lands, 8,640 acres all told, including the main mine tract of 1,120 acres, in Sections 10, 11, 14 and 15, T. 56 N., R. 33 W., the Cliff mine, in Keweenaw county, a millsite on Torch Lake and extensive tracts of timber lands adjacent to mine and mill. The mine tract, of very irregular outline, is bounded on all sides by lands of the Calumet & Hecla. The Tamarack is opened on the underlays of the Calumet conglomerate and Osceola amygdaloid beds, the latter developed by crosscuts run east from the conglomerate workings. The mine was planned by the late Capt. John Daniell, who conceived the idea of opening the underlay of the conglomerate by a deep vertical shaft. Actual work of sinking No. 1 shaft was begun in 1882 and the conglomerate was

cut in 1885, three and a half years later, at a depth only 10' greater than the estimate of Capt. Daniell, made before the first sod was removed.

The mine is opened by 5 shafts, Nos. 1 and 2, in the extreme southeastern corner of the tract, being known as the Old Tamarack, while shafts 3 and 4 are known as the North Tamarack, No. 5, the newest and deepest shaft, being about midway between the North and South Tamarack shafts. No. 1 cuts the conglomerate at 2,270' and No. 2 at slightly greater depth. These two shafts have given the richest rock found in the mine, and from the 40 acres developed by them practically all of the Tamarack dividends have been earned. No. 1 is 3,409' in depth, with a productive capacity of about 400 tons daily. Owing to insufficient pillars, this shaft has suffered from drawing, but has not yet been retimbered, as its production cannot be spared. No. 2 shaft, 4,355' deep, suffered a crush in 1904, and it became necessary to retimber throughout. In vertical shafts approaching one mile in depth, an absolutely perpendicular line cannot be maintained permanently, where the superimposed strata incline at any considerable angle, as in the case of the Tamarack. Slipping that could not be detected on surface will work havoc with the perpendicularity of a deep shaft, in the course of years. No. 2 shaft became so badly drawn, early in 1904, that cages could not be operated, and the management courageously and wisely took the bull by the horns, and rebuilt the shaft from top to bottom. It being manifestly impossible to make any shaft immune from drawing through earth movements, a double-lined shaft was constructed. This has an outer and an inner lining, the inner lining braced against the outer with heavy timbers of varying length. These braces can be shortened or replaced, from time to time, and No. 2 shaft, as now built, should last the lifetime of the mine. Shafts 1 and 2 are supplied with powerful hoists, good for the depths to which they can be sunk.

Nos. 3 and 4, the North Tamarack shafts, are about one mile north from and slightly east of shafts 1 and 2. No. 3 is 5,066' in depth, being the deepest on the globe, and is located 4,200' northeast of No. 2, cutting the conglomerate at a vertical depth of 4,185'. The conglomerate at this point runs 20' to 25' in width, and is irregular in contents and far from rich, the best ground being found in the southern drifts toward No. 5. Production of No. 3 shaft is about 1,000 tons of stamp-rock daily. Surface equipment at the North Tamarack is very complete, No. 3 shaft having an Allis hoist, with double conical drum of 13' 6" diameter at either end and 36' 9" diameter in the center. The cable winds over specially built-up runs of steel affixed to the surface of the drum, which works in counterbalance. This hoist has raised a 10-ton load vertically at a speed of 55 miles per hour, and running at that rate has been brought to a stop in a distance of 75'. No. 3 shaft has a 60-h. p. fan, 10' in diameter, with blades 3' 6" wide, capable of supplying 192,000 cubic feet of free air per minute to the depth of the shaft, which not only ventilates the mine but also aids in reducing the temperature, that otherwise would be nearly 90° Fahrenheit in the bottom levels. The auxiliary hoist at No. 3, used for lowering and raising men and timber, is a Nordberg duplex, with 32x72" cylinders and 72" stroke, having a drum of

18' 6" diameter with lathe-turned grooves for coiling the cable. No. 4 shaft, 600' northeast of No. 3, is 4,450' in depth, and has not been deepened since bottomed in 1895. A rich chute of copper-bearing ground has been opened recently on the 14th level, but the shaft is poor as a whole. Underground connection is had with No. 3, giving ventilation, and safety to miners in case of accident. No. 4 is used exclusively for hoisting water, lowering and raising men, and for purposes of ventilation and safety. A new concrete lining was substituted for the old wooden timbering through the overburden, in 1904.

No. 5 shaft, lying about 3,300' southwest of No. 4, and about midway between the Old Tamarack and North Tamarack shafts, is 4,967' deep. Sinking was begun Aug. 7, 1895, and the conglomerate was cut on Dec. 20, 1901, at a vertical depth of 4,662', the late Capt. Wm. E. Parnall having foretold the depth within 12' and the time required within 11 days, when the work was begun, 6 years before. The shaft is 7x29', inside measurement, with 5 compartments in a row. The three central compartments, 5'x7' 2" each, are used for cages. One of the end compartments, also used for a cage, is 7' 2"x5' 4", the extra 4" being allowed for timber strain, while on the other side of the shaft is a compartment 3'x7' 2" for ladders, pipes and wires. The 10x14" wall-plates of this shaft are 29'2" long and the 5x7" runners, serving as guides for the cages, are 16' to 22' in length. Instead of lag-screws being countersunk, the runners have a central groove 2" wide and 1½" deep, running from top to bottom on both sides of each of the four hoisting compartments, these grooves providing for the escape of loosened lag-screws without damage to cages or runners. The shaft openings have automatic covers that lift for passage of the cages. In sinking this shaft 83 separate strata of strap, amygdaloid and conglomerate rocks, all barren, were cut before the Calumet conglomerate was reached. Drifts have been opened both north and south, on the 31st to 38th levels inclusive, the northern drifts showing poor ground, with some improvement to the south. As a whole No. 5 shaft is decidedly low in grade, although the conglomerate is of good average width, and the ground opened during 1904 showed some improvement over the openings of the two preceding years. Connection has been secured underground with Nos. 1 and 2 shafts, and will be secured eventually with Nos. 3 and 4.

Surface equipment at No. 5 is the heaviest at any shaft of the mine. The engine-house, boiler-house and compressor buildings are of redstone, with steel truss roofs. The engine-house has two duplicate 6,500-h. p. Nordberg hoists, each with four 36" high-pressure cylinders having 72" stroke. The drums are 24' in diameter in the center, tapering to 16' at the sides, each half carrying 6,500' of 1½" steel cable, the hoists operating in counterbalance and being capable of raising from a depth of 6,000' a net load of 6 tons of rock, this having a gross weight, with cage and cable, of about 12 tons. The hoists cost \$60,000 and \$90,000 respectively, the second hoist being installed in October, 1904, almost immediately after which an accident put the first hoist out of commission. The boiler-house has six 200-h. p. Burt boilers with 84" shells, and two 115' brick-lined self-supporting steel smokestacks. Coal is delivered to the boiler-room from a railroad trestle.

The 50x75' redstone compressor building has a 35-drill Ingersoll-Sergeant two-stage cross-compound air-compressor, with 18x34" steam cylinders and 36" stroke, and a 100-drill triple-expansion Nordberg compressor with 19x53x48" steam cylinders, and two-stage air cylinders of 18x27x48".

The shafthouse and rockhouse at No. 5, built by the Wisconsin Bridge & Iron Co., at a cost of nearly \$100,000, are on separate foundations and separately framed and braced, although apparently standing as one building, 56x120' on the ground, with an extreme height of 131'. The foundations are exceptionally massive and the girders and framing are of unusual strength, to withstand the great strains caused by hoisting heavy cages and the operation of powerful rock-breaking machinery. These buildings required about 700 tons of steel and 100 tons of corrugated iron siding in construction. Although 10 carloads of lumber were used in the building, no wood is exposed, except in the floors, asbestos sheathing-paper being used elsewhere to protect the wood, thus rendering the building practically fireproof. The rockhouse has 3 Portage Lake crushers of the reciprocating jaw type, with room for 5 more when needed. Miscellaneous buildings at No. 5 shaft include a stone dry and smithy.

Water for mine boilers and domestic use is pumped from Lake Superior against a head of nearly 700'. The pumping station, nearly 5 miles north-west of the mine, has a Nordberg duplex pump capable of raising nearly 1,500,000 gallons daily. Water is taken from a 40' well on the lake shore, connected with a tunnel driven 480' under the bed of the lake, with about 35' of water above the intake. Water is delivered into two steel tanks, of 42' and 65' diameter, on the highest point of the Tamarack lands, these having a combined storage capacity of 200,000 gallons, water being distributed into mains from these standpipes. The pumping plant has developed remarkable efficiency, cost of operation being only about \$10 per diem, including fuel and wages.

The Tamarack mine location is extensive, with a large number of dwellings for employes. The company owns and operates a hospital, 60x60' in size, with two full stories, basement and attic. The basement and first floor are of selected Lake Superior redstone, upper story and attic of frame, with interior finish of selected quarter-sawed Georgia pine. The building has emergency wards, operating room, dispensary, sun veranda, elevators and indirect steam heating.

The Tamarack owns the old Cliff mine, in Keweenaw county, the oldest mine in the Lake Superior district, which paid dividends of \$2,518,620 from 1849 to 1879, inclusive. The mine was opened on a fissure vein, which was worked out and the property abandoned in 1878. Diamond drilling was done on this tract during 1903 and 1904, the cores locating two cupriferous amygdaloids, one of which is supposed to be the northern extension of the Kearsarge lode. The Cliff tract is of considerable promise, and may prove the ultimate salvation of the Tamarack company.

The Tamarack has two stamp mills, located on Torch Lake, a little more than a mile south of the Calumet & Hecla mills. The mills have 7

stamps, with an aggregate daily capacity of fully 2,500 tons of conglomerate rock. The heads have been fitted with eight-inch mortar-grates, opening into quarter-inch-mesh revolving screens having Parnall-Krause hydraulic discharges. Finisher jigs have been replaced by Wilfley tables and Nordberg crushing rolls were installed, 1904, to care for the raggings from the stamp-mortars. A contract has been let for one steeple-compound Nordberg stamp, and if this proves satisfactory the entire mill may be changed over.

Water for the mills is furnished by a 40,000,000-gallon pump and smaller pumps of 15,000,000 gallons daily capacity, owned and operated jointly by the Tamarack and Osceola companies, and it is planned to install another 40,000,000-gallon pump, to care for the greatly increased stamping capacity brought about by compounding the stamp-heads of the 4 active mills of the two companies.

The wharves and steel coal-sheds of the Tamarack and Osceola, at Dollar Bay, are among the most extensive in the Lake Superior district.

Smelting is done at Dollar Bay and Hancock, in the works of Lake Superior Smelting Co., controlled by the Tamarack, Osceola and Isle Royale companies. All mineral is taken from mills to furnaces in hopper-cars, saving the cost of barreling.

Production of refined copper has declined for several years past, but should increase in 1905. Mining is unavoidably expensive, owing to the opening of the conglomerate on the underlay. As the lode dips at an average angle of 37° 30' and is opened by a vertical shaft at 90°, productive ground is reached only by long and expensive crosscuts, while trams are both long and costly. It would seem as though the Tamarack might install electric traction to advantage. The percentage of copper in rock stamped has shown a steady decrease for many years, until 1904, when there was a small gain. The returns now average 23.3 lbs. fine copper per ton, as against 65 lbs. in the mine's early days—a decrease of almost two-thirds—and a considerable proportion of the rock stamped returns less than 1% ingot copper. The property is being well managed, but the task is a heavy one. In good years the Tamarack can earn considerable profits, while in bad years but little, if anything, more than expenses, can be made.

MINA TAMAYA.

CHILE.

An idle mine, once important, 65 miles from Coquimbo, Chile.

TANGANYIKA CONCESSIONS, LTD. RHODESIA & CONGO FREE STATE.

Offices: 30-31, Clements Lane, London, E. C., Eng. Registered Jan. 20, 1899, with capitalization £264,600, shares £1 par; issued, £234,000. Debentures, £30,000 authorized, £10,000 issued, but since redeemed. Tyndale White, chairman; Robt. Williams, managing director; Geo. Grey, manager in Africa; R. M. Irwin, mine manager; John R. Farrell, consulting engineer; L. Scotland, secretary. Lands, 2,000 square miles, north of the Kafue and Zambesi rivers, in the Katanga district, Rhodesia, near the Congo Free State boundary, also 2,000 acres for railroad and steamship terminals, at the southern end of Lake Tanganyika, and concession to explore extensive areas in the Congo Free State for 5 years, ending Dec. 31, 1905, and to work any

discovered mine for 30 years, with option of extending period of working to 99 years. Also has a 40% interest in the Katanga or Lobito Bay railway. In the Congo Free State 72 large mining concessions have been located, and company estimates that 5 of these claims show 15,000,000 long tons of 10% copper ore, most of which can be won by quarrying, and on another group company estimates 1,500,000 tons of 13% copper ore.

The principal copper mines of the company, in various stages of development, are the Kansanshi, Kambobe, Kabalela, Kakanda, Likasye and Fungurume. Principal developments are on the Kansanshi, said to have a 18' fissure vein, with north and south strike, which has been worked open-cast, by natives, for centuries, the mine showing trenches and pits for a distance of about 6,000', these varying in width from 1' to 75' and in length from a few feet to 1,200', with extreme depth of 50' in the deepest pit. Country rock is sandstone, in places micaceous and fissile, and in other soft and clayey through partial decomposition, the sandstone being more or less charged with malachite, occurring as speiss. In the upper portions the vein matter carries malachite and chrysocolla, with occasional occurrences of azurite and melaconite, but in the deeper portions has chalcocite and chalcopyrite in connection with iron pyrites, with occasional cuprite, the gangue being silicious, with considerable manganese dioxide in the superficial portions. The ferruginous matter in the gangue is chiefly limonite, usually somewhat ochrous, but occasionally hard and compact. The outcrops are mainly malachite, and are stated by Mr. Farrell to show no evidence of resulting from alteration of sulphides in place, the evidence leading Mr. Farrell to the opinion that the malachite was deposited from hot solutions coursing in a fissure. Five shafts have been sunk in old trenches, showing veins of 1' to 18' width, and ore is stated by Mr. Farrell to average 15% copper, at a depth of 100', mainly from malachite, with traces of sulphides. Ore carries an excess of about 35% silica, and will require heavy fluxing, for which purpose iron ore and limestone in abundance are not far distant.

The Fungurume mine has 4 short tunnels, one of which is stated to have penetrated 191' of ore. The Likasye also is being opened by a tunnel. Principal developments outside of the Kansanshi are at the Kambobe. No. 2, which has two shafts, H and I, about 100' deep each, with crosscuts said to expose an ore body of nearly 300' width.

The company also has a gold mine, known as the Ruwe Hill, which shows a 9' to 14' vein on the 100' level, said to average about 6 dwts. gold and 8 dwts. platinum per long ton. The surface workings of the Ruwe Hill are notably rich, and from these the company is producing about 500 oz. monthly, at a cost of about 12s. per ounce, with sluices made out of old packing boxes. The surface deposits are estimated to carry about 20,000 oz. fine gold, which can be secured at nominal cost.

The company owns and operates stores and also has a small steamer on Lake Tanganyika, laid up at last accounts. The company has a railway concession from the Portuguese government for construction of a line from Lobito Bay to Lake Tanganyika, which will require an expenditure of about

£4,000,000. Work on the construction of this line was resumed Nov. 26, 1904. The climate near Tanganyika is said to be very good for equatorial Africa, with an abundance of wood, and good water. The properties of the company would seem to be of altogether exceptional promise.

TARBOX MINE.

MONTANA.

Mine office: Saltese, Missoula Co., Mont. Has produced excellent specimens of high-grade copper ore, but is little developed.

TARTANA, LTD.

AUSTRALIA.

Offices: London Bank Chambers, Creek St., Brisbane, Queensland, Australia. Mine office: Chillagoe, Queensland, Australia. Organized under laws of Queensland, with capitalization £120,000, shares 5s. par. H. M. Hicks, chairman; G. S. Murphy, auditor; King & Rutledge, solicitors; J. B. Charlton, broker; E. Austin Bell, secretary. Lands, 230 acres, leasehold, on the Walsh river, about 30 miles northwest of Chillagoe, showing large deposits of auriferous and argentiferous oxidized ores, below which considerable bodies of sulphides should be found. Ships some hand-picked ore, averaging 15% in copper tenor, to the Chillagoe smelter.

TASMAN-COMSTOCK CONSOLIDATED.

TASMANIA.

A prospect in the Mt. Lyell district of Montague county, Tasmania, which was driving a tunnel with 5 men, in June, 1904.

TASMAN & CROWN LYELL EXTENDED MINING CO.

TASMANIA.

Offices: 47, Queen St., Melbourne, Australia, and care of Hon. N. J. Brown, agent, Hobart, Tasmania. R. Giles, chairman; John Brandon, secretary; E. Holehan, mine manager. Capitalization, £150,000; issued, £82,000. Lands, 181 acres, on Mt. Lyell, developed by 3 tunnels, longest 1,453', showing a little copper ore, with indications of larger bodies ahead. Employs 6 men.

TASMAN LYELL COPPER CO., LTD.

TASMANIA.

Absorbed, March, 1903, by Lyell-Comstock Consolidated Copper Co., Ltd.

TASMANIAN COPPER CO., LTD.

TASMANIA & AUSTRALIA.

Offices: 348, Winchester House, London, E. C., Eng., and Patterson St., Launceston, Tasmania. Mine offices: Rosebery, Montague Co., Tasmania, and Blinman, South Australia. Organized Jan. 13, 1897, with capitalization £325,000, shares £1 par; issued, £317,069. F. L. Cox, chairman; C. M. Henrie, general manager; J. G. Coldwells, secretary. The Tasmanian property includes the Rosebery and Ring River mines, area 386 acres, also a 5-acre smelter-site, in the West Coast district, showing a 24' fissure vein traceable about 3,000', carrying 1% to 3% copper, 10 oz. silver and 3 dwts. gold per ton. Ore is zinciferous chalcopyrite, and owing to excess of zinc at depth, no satisfactory method of reduction has been secured. Mine is developed by tunnels, longest 644', with about 1,600' of underground openings, and ore reserves are estimated by company at 158,400 tons.

The Blinman mine, in the Flinders Range of South Australia, 270 miles north of Adelaide, was bought 1902, and is proving somewhat uneven in values. The Blinman, opened 1862, reopened circa 1899, has a 450' main shaft, and has produced considerable ore averaging 8% in copper tenor, as mined, concentrated to an average tenor of 23% copper for shipment to smelters,

in addition to which small quantities of hand-picked ores of 30% to 40% tenor have been shipped. District is arid and considerable trouble is experienced in the dry season from inadequate water supply. Ore reserves at the Blinman, June, 1904, were estimated at 58,500 tons, with about 20,000 tons of medium-grade ore on surface. Work is proceeding systematically, with fair prospects, at the Blinman.

TASMANIA COPPER MINING & MILLING CO.**COLORADO.**

Office: 603 Provident Bldg., Philadelphia, Pa. Mine office: Winfield, Chaffee Co., Colo. D. B. Dance, vice-president; G. Albert Smyth, secretary; Edw. O. McHenry, treasurer. Organized April 20, 1898, under laws of Colorado, with capitalization \$1,000,000, shares \$1 par. Lands, 13 claims, area about 250 acres, in the La Plata district, with about 2,500' of underground openings, showing ores carrying gold, silver, lead, copper and zinc. Has a pyritic smelter, of 20 to 40 tons daily capacity. Mine is estimated to show 750,000 tons of auriferous and argentiferous copper ore, galena and sphalerite.

TATERI MINE.**JAPAN.**

Mine office: Nosakogawa-mura, Yoshino-gori, Yamata, Japan. A very small producer of copper.

TAUNTON-NEW BEDFORD COPPER CO.**MASSACHUSETTS.**

Office and works: New Bedford, Mass. Henry M. Lovering, president; Clarence A. Cook, vice-president and agent; Henry F. Bassett, treasurer. Is a consolidation of the Taunton Mfg. Co., New Bedford Copper Co. and Revere Copper Co. Has copper and brass rolling mills.

TAYLOR COPPER MINES CO., LTD.**ONTARIO.**

Office: care of Robt. H. Taylor, president, Sault Ste Marie, Mich. H. P. Taylor, secretary. Has expended about \$30,000 in exploratory work and development. Idle since circa 1903.

TECOLOTE COPPER CO.**NEW MEXICO.**

Mine office: Las Vegas, San Miguel Co., N. M. Has steam power and concentrator.

TECUMSEH COPPER CO.**MICHIGAN.**

Office: 15 Congress St., Boston, Mass. Mine office: Calumet, Houghton Co., Mich. Organized under laws of Michigan, with capitalization \$2,500,000, shares \$25 par; issued, \$1,373,975. John C. Watson, president; Daniel L. Demmon, secretary and treasurer; Jas. Chynoweth, superintendent. Lands, 560 acres, next south of the Osceola. Several shafts have been sunk at various times, including one of 1,000' on the Calumet conglomerate, which was barren, and another of about 2,300' on the Osceola lode. Idle since November, 1902. Developments on lands a short distance north lead to the inference that the Kearsarge lode may be found to carry payable values on the Tecumseh tract, and exploratory work to locate and test this amygdaloid bed may be started during 1905.

TEHAMA MINING CO.**CALIFORNIA.**

Office: care of C. J. Gooch, president, Red Bluff, Cal. Property is the Donkey mine, supposedly a continuation of the Afterthought of the Great

Western Gold Co., in Shasta county, California, and is said to show a considerable body of medium-grade ore. Idle.

TELEPHONE-ANCHOR MINE.

WYOMING.

Mine office: Rambler, Carbon Co., Wyo. Lee Campbell, superintendent.

TELESFORO COPPER CO., LTD.

SPAIN.

Offices: 70, Queen Victoria St., London, E. C., Eng. Mine office: Cortegana, Huelva, Spain. Organized March 9, 1904, with capitalization £50,000, shares £1 par; issued, £9,207. Vicomte de la Jaille, chairman; T. Greenhill, secretary. Lands include El Telesforo and La Segura mines, near Cortegana.

TELLER MINING & MILLING CO.

COLORADO.

Mine office: Idaho Springs, Clear Creek Co., Colo. John Owen, manager. Ores carry gold, silver, lead and copper. Has steam power.

TEMPEST MINING & SMELTING CO.

OREGON.

Mine office: Alamo, Umatilla Co., Ore. Ores carry gold, silver and copper. Has electric power and 20-ton smelter, employing about 25 men.

FUNDICION TEMPLEMAN, LTD.

CHILE.

Voluntarily wound up, July, 1902.

TENDERFOOT MINING COMPANY.

WYOMING.

Mine office: Douglas, Converse Co., Wyo. W. F. Hamilton, president; B. J. Erwin, secretary and treasurer. Lands, 6 claims, with a 90' shaft showing ore averaging 4.5% copper. Has a 700' steam hoist.

TENNESSEE COPPER CO.

TENNESSEE.

Office: 11 Broadway, New York. Mine office: Copperhill, Polk Co., Tenn. Employs 721 men. Organized April 26, 1899, under laws of New Jersey, with capitalization \$5,000,000, shares \$25 par; issued, \$4,375,000. Debentures, \$450,000 in 20-year 5% bonds of \$1,000 each. Paid 5% dividends July 1903, January 1904 and January 1905. J. Parke Channing, president; Frederick Lewisohn, vice-president; J. H. Susmann, treasurer; preceding officers constitute the executive committee; E. C. Westervelt, secretary; preceding officers, H. H. Rogers, A. C. Burrage, Walter Lewisohn, Philip S. Henry, Jas. Phillips, Jr., directors; Randolph Adams, general manager; B. B. Gottsberger, assistant general manager; Wm. A. Heywood, smelter superintendent; John Edwards, mine superintendent; Ben. H. Case, engineer; State Street Trust Co. and Colonial Trust Co., Boston, registrars, Old Colony Trust Co., Boston, and National City Bank, New York, transfer agents.

Lands, 2,080 acres, also 11,000 acres of miscellaneous lands, in the Ducktown district, showing 6 series of lenses, of which 3 are being developed. Ore occurs as lenses in fissure veins, lenses averaging 30' to 70' in width and 500' to 2,000' in length, with an average depth of 400'. Ore is chalcopyrite, associated with iron pyrites in a quartz gangue, carrying 2% to 4% copper, about 40% iron, 27% sulphur and 15% silica, with only traces of gold and silver. Country rock is metamorphic micaceous schists, of pre-cambrian age, ore bodies showing extensive gossan cappings, and originally having a little oxidized ore near surface, which was mined out long ago. As zinc and other refractory elements are lacking, the ore is excellently adapted to

cheap and close concentration, and also smelts well, giving very clean slags.

Mines of the company include the Burra Burra, London, Tennessee, and Polk county, each developed to depths of 300' or more. These mines were opened circa 1850, and were operated regularly previous to the Civil War. The principal property is the Burra Burra, having a 605' main shaft, sunk in the solid footwall to guard against drawing. This mine has about 8,000' of underground openings, not including worked-out stopes, with nearly 2,000,000 tons of ore blocked out for stoping. The lense is 30' to 85' in width and opened for a distance of 1,030' on the third level. The London mine has a 588' main shaft, with a lense 25' to 75' in width, and 500' long on the first level. The Polk County mine has a 300' shaft, with an ore body 20' to 90' in width and of undetermined length and depth. The mines have 3,425,000 tons of ore in sight, with 2,835,000 tons blocked out for stoping.

The mines have a complete machinery plant, including water-tube boilers, Nordberg first-motion hoists, and a Nordberg cross-compound two-stage air-compressor. The shafthouses are a sort of cross between the rockhouses of the Lake Superior native copper mines and the concentrators of the copper ore mines, being equipped with 100-h. p. compound engines, 18x31" crushers, 42'x144' screens and 36"x33' Robins conveying-belts for hand-sorting, these shafthouses having a daily crushing and assorting capacity of about 2,000 tons, ore being reduced to 4' size. The Burra Burra shafthouse is 127' in height.

The smelter, at Isabella Junction, is a little north of the old Tennessee mine, and one to five miles from the other mines of the company. Ore is taken to the smelter over the company's 7½ mile standard gauge private railroad, connecting with the Atlantic, Knoxville & Western Ry., and equipped with four 50-ton locomotives and 65 thirty-ton ore cars. The company owns about 60 dwellings for employees.

The company's smelting process was changed radically, in 1903, when the old process of heap roasting was abandoned for semi-pyritic smelting. This cut down production and increased costs for the year, but should result in a considerable saving in net costs hereafter.

The reduction plant, designed by J. Parke Channing, and built under his supervision, is admirably planned, in logical order, all material being handled automatically wherever possible, and results obtained are among the best ever secured at any copper smelter. The furnace building is of steel, with large ore bins, and the works have a daily capacity of 1,500 tons, being equipped with 3 water-jacket blast furnaces, 50x180" at the tuyeres, 72x180" at the tops and 18' from tuyeres to charging floor. Furnaces are charged by 2-ton cars, drawn by electric locomotives, a limited amount of barren quartz being used as a flux in furnace mixtures. Furnaces have 3 Nordberg cross-compound condensing blowing engines, with steam cylinders 56" and 56x42", running 66 revolutions per minute and delivering air at a blast pressure of 35 oz. to 40 oz. per square inch. There also is a 25-ton refining furnace, 2 stands of converters with 84x126" shells, and a horizontal blower for the converters. Slag-pots are handled by electric locomotives, slag being

used as railroad ballast. The plant has a large dust-chamber. The power-house at the smelter is of steel and brick, with four 250-h. p. water-tube boilers, and an electric plant furnishing power and light. The change from roasted to raw ores decreases the daily capacity of each furnace, and as the development of the mine justifies a greatly increased production, extensive additions are to be made to the smelter, these including the erection of 4 new blast furnaces, each 56x270", 3 new 30,000' blowing engines, 1 new converter stand with 5 shells, two 250-kw. electric generators and new 1,000-h. p. boilers. To house the new plant an addition of 20x300' will be made to the blast-furnace building, a 10x150' section added to the power-house, and a new boiler-house erected.

Although the mines are very extensively developed, new work will be continued, and the Macpherson shaft of the Burra Burra will be unwatered and development resumed at that point. The company also owns iron lands, the Eureka iron mine, operated under lease by the Virginia Iron, Coal & Coke Co., producing 41,882 long tons of iron ore in 1904. The question of damages to adjoining lands from smelter fumes was carried to the United States Supreme court in 1904, and decided in favor of the company, the fact that the damage was done to lands in the adjoining state of Georgia necessitating adjudication by the federal courts.

Production of fine copper was only 8,617,697 lbs. in 1904, as against 10,690,389 lbs. in 1903. The decrease was due to a variety of causes, chief among these being the change from roasted to raw ores in smelting. For 1905 the company estimates a production of but 10,000,000 lbs., as the new plant scarcely can be in full running order until the latter half of the year, but for 1906 the production should reach 18,000,000 to 20,000,000 lbs. For 1904, owing to reduced tonnage, costs per pound of fine copper were increased, reaching 9.59 cents, but these costs should show considerable reduction in 1906 and considering that the net extraction was but 35.632 lbs. per ton of ore treated, are highly creditable. The Tennessee has the largest proven ore body in the Appalachian region, and is the only successful copper producer east of Lake Superior in the United States. The company also has the inestimable advantage of a strong and thoroughly competent and progressive management.

TERANO MINE.

JAPAN.

Mine office: Saretani-mura, Iyo-gori, Iyo, Japan. Ore is chalcopyrite, associated with iron pyrites, averaging 4% to 5% copper. Vein averages 1' to 2' and occasionally is 7' wide, in country rock of chloritic schist. Production in 1898 was 25,974 lbs. refined copper.

TETON COPPER MINING & SMELTING CO.

WYOMING.

Letter returned unclaimed from former office, Jackson Hole, Wyo. Was organized in 1903, to prospect for copper in the Teton Mountain range.

TEXADA COPPER MINING CO.

BRITISH COLUMBIA.

Office: 205 Equitable Bldg., Tacoma, Wash. Mine office: Van Anda, Texada Island, B. C. Organized May 12, 1903, under laws of Washington, with capitalization \$1,000,000, shares \$1 par. J. M. Dennett, president and

general manager; O. L. Doane, secretary. Lands, 7 claims, area 270 acres, held under 30-year lease, with 230 acres of miscellaneous lands, in the Nanaimo district, showing several outcrops, one averaging 18" width at surface and 24" at depth, opened by a 70' shaft showing chalcopryite and bornite assaying 12% copper, 10 oz. silver and \$2.80 gold per ton. Has a steam hoist and air-compressor, and planned shipping ores to smelters by water, over a 900' surface-tram from shafts to bunkers on wharf at tidewater. Cannot be learned that any work is in progress.

TEXAS CONSOLIDATED MINES & POWER CO.**CALIFORNIA.**

Mine office: Redding, Shasta Co., Cal. H. C. Woodrow, superintendent. Ores carry gold, silver and copper. Has electric power and 20-stamp mill.

TEXAS COPPER CO.**TEXAS.**

Office: care of Glenn N. Congdon, Gowanda, N. Y. Organized July, 1902, under laws of New York, with capitalization \$1,000,000. Lands are sundry claims in Texas, carrying indications of copper, salt and gypsum.

TEZIUTLÁN COPPER CO.**MEXICO.**

Office: 27 William St., New York. Mine office: La Aurora, via Teziutlán, Puebla, Mex. Employs 800 men. Organized under laws of New Jersey, with capitalization \$1,000,000, shares \$100 par. Geo. D. Barron, president and general manager; Robt. S. Towne, vice-president; C. J. Nourse, Jr., secretary and treasurer; E. R. Dalbey, general manager; F. R. Brown, assistant manager; A. F. Schneider, mill superintendent; E. du B. Lukis, engineer. Lands, 4,500 acres, also a 15-acre smelter-site and 400 acres of miscellaneous lands, in the Teziutlán district. Climate is equable and property is surrounded by fine arable lands. Labor is good and in sufficient supply, and property is served by the Interoceanic Railway of Mexico.

The mine is opened mainly by tunnels, developing a considerable body of basic auriferous and argentiferous chalcopryite, associated with sphalerite, carrying about 8% copper, up to 200 grams silver and 5 grams gold per metric ton. Ores also carry about 15% iron, 2% sulphur, 30% silica and 10% calcium. Water is brought by a 3,600' flume, under a 900' head, generating 1,000 h. p., which is transmitted electrically to the mine, about 6 kilometres distant. Smelter, adjacent to the mine, receives ore by aerial tram. The smelting plant has about 250 tons daily capacity, treating about 5,000 tons monthly, shipping product as converter bars averaging 98.6% fine. Production, 1903, was 6,786,488 lbs. fine copper. The Teziutlán is much the most important copper mine of southern Mexico.

GEWERKSCHAFT DER ZEHE THALBURG.**GERMANY.**

Office: Düsseldorf, Germany. Mine office: Heiligenhaus, Rheinprovinz, Germany. Louis Zurhelle, president; H. Dressler, engineer. Has 2 shafts, developing sulphide ores of lead, zinc, copper and iron. Was working in a very small way at last accounts.

THARSIS SULPHUR & COPPER CO., LTD.**SPAIN.**

Offices: 136, West George St., Glasgow, Scotland. Mine office: Alosno, Huelva, Spain. Sir Charles Tennant, Bart., chairman; Alex. Moore, Jr.

and Robert C. Mackenzie, auditors; Wm. P. Rutherford, general manager; Geo. Gray, superintendent; David Barlas, secretary. Registered October 27, 1866, with capitalization £1,250,000, shares £2 par. Has paid regular dividends, since 1881, of $7\frac{1}{2}\%$, lowest, in 1866, to 30%, highest, in 1900, dividends being 15% in 1902 and $17\frac{1}{2}\%$ in 1903. Net profits for 1902 were £169,602, and for 1903 were £218,860.

Lands include the Tharsis group, area 1,143 hectares, and the Lagunazo group, area 271 hectares, at Alosno, about 30 miles west of the Rio Tinto, also the Calañas or Zarza group, area 618 hectares, at Calañas, midway between the Tharsis and Rio Tinto mines. The mines at Alosno were worked by the Romans, and probably by their predecessors as well, and are identified by some with the Tarsish of the Bible. General geological conditions are much the same as at the Rio Tinto, the mines being in the southern zone of the Andevallo or Sierra Morena district of Huelva, showing 4 main lenses, these having their axes of greatest length southeast by northwest. The largest lense is the Criadero del Sur, to the south. The Filon del Norte, to the northeast, is about 600 metres long and 140 metres in extreme width. The two smaller lenses are the Criadero de la Sierra Buillones and the Filon del Medio, to the northwest. The Tharsis and Lagunazo have been the principal producers in the past, but are nearing exhaustion. The Calañas is developing rather better than expected, and now has ore reserves for about 10 years' production. The company also is developing the Almegrera and Triunfo groups, near Alosno and these are proving valuable properties. The Vulcano mine, at Alosno, also is under investigation.

The ores of the Tharsis average about 3% copper, 50% sulphur, and 45% iron, with small quantities of gold, silver, lead, zinc, nickel, bismuth, antimony and arsenic. After extraction the ore is piled in heaps and weathered, this process being assisted by occasional sprinkling. The leach-water goes into creosoted timber sluices, where the copper in solution is deposited on pig-iron. The company owns a railway leading from the mine to Corrales, and has a shipping pier at that port. The company also owns extensive works at Hebburn-on-Tyne, Willington-on-Tyne, at Oldbury, a suburb of Birmingham, at Garngad, a suburb of Glasgow, and at Cardiff, Wales.

Owing to the exhaustion of its principal ore bodies and a rather alarming annual decrease in production, the company has been endeavoring for several years to secure new mines, and with that end in view has investigated sundry properties in Norway, Italy, Cyprus, Russia, Tennessee, Arizona and Mexico. The company bought the Aamdal mine, at Mo, Bratsbergamt, Norway, which made 240 tons of refined copper in 1895, and gave the property considerable development, proving up a large ore body of lower grade than expected, hence the mine was sold to a Norwegian syndicate. The company is said, though statement lacks verification, to have bought the Trotter mine, a slightly developed sulphide ore property, at Webbwood, Algoma, Ontario, early in 1905.

Production of copper was 11,147 long tons in 1898, 7,967 tons in 1900,

6,708 tons in 1902 and 5,620 tons in 1904, showing a decrease of nearly one-half in six years, owing to the practical exhaustion of the largest Spanish ore bodies. The company has a conservative and thoroughly good management, and it is to be hoped that it may be successful in finding new ore bodies, in Spain or elsewhere, to take the place of its original Spanish properties. **THOMPSON SIDING COPPER-GOLD MINES, LTD. BRITISH COLUMBIA.**

Dissolved, August, 1904.

THREE BEARS MINING CO.

NEW MEXICO.

Office: 1416 North 12th St., Philadelphia, Pa. Mine office: Brice, Otero Co., N. M. Employs 21 men. Organized Jan. 27, 1903, under laws of New Jersey, with capitalization \$2,000,000, shares \$1 par. Isaac W. Heysinger, president; Ogden D. Wilkinson, vice-president; Dudley T. Lindsay, secretary; Ephraim Brice, treasurer; Frank B. Schermerhorn, general manager. Lands, sundry claims, area 220 acres, in the Silver City and Organ districts of Otero and Donna Ana counties, showing numerous fissure veins, of which 9 are being developed to some extent, these ranging 5' to 30' in width and giving assays of 3% to 40% copper, up to 50 oz. silver and 0.1 oz. to 10 oz. gold per ton, also more or less lead, zinc and manganese, with occasional turquoise. Ores are of great variety including nearly every commercial form.

Development is by shafts of 100', 150', 200', 300' and 500', with about 3,000' of underground openings, estimated to show 10,000 to 50,000 tons of ore, with 1,000 to 3,000 tons of high-grade ore blocked out for stoping. Has steam plant with hoists and air-compressor, and all necessary shops, offices and dwellings.

Company plans building reduction works, which probably will include both concentrator and leaching plant. Management seems business-like and property is regarded as decidedly promising.

THREE JAYS COPPER CO.

BRITISH COLUMBIA.

Mine office: Alberni, Vancouver Island, B. C. Idle since 1902.

THREE PEAKS MINING CO.

CALIFORNIA.

Office: care of T. S. Henderson & Co., 500 Commercial Bldg., St. Louis, Mo. J. J. Chambers, vice-president and general manager. Lands, in Trinity county, California, are said to show gold-copper ores.

VEREINIGTE THÜRINGISCHE KUPFERBERGBAU

GERMANY.

GEWERKSCHAFT.

Mine office: Gotha, Saxe-Coburg-Gotha, Germany. Karl Gürtler, manager. Property is the Carl Alexander, Sophie, Carl August, Bernhard and Wilhelm Ernest mines.

ASOCIACION DE PROPIETARIOS DE LAS MINAS

SPAIN.

DEL TIBIDABO.

Offices: Moncada 31, Barcelona, Spain. Mine office: Cassolas, Barcelona, Spain. Property is the mina San Gervasio de Cassolas, showing a chalcopyrite ore body. Idle.

TICON MINE.

MONTANA.

Office and mine: care of James A. Murray, owner, Butte, Silver Bow

Co., Mont. Lies east of the Speculator mine, and has a 500' shaft, sunk on the pitch of the vein, showing about 4' of good ore at the bottom.

TIGER MINE.

NEVADA.

Mine office: care of J. A. Nelson, owner, Lovelock, Humboldt Co., Nev.

TILT COVE COPPER CO., LTD.

NEWFOUNDLAND.

Offices: 9, Queen St. Pl., London, E. C., Eng. Col. J. W. Young, chairman; E. C. Leaver, secretary; John Taylor & Sons, managers. Organized Apr. 4, 1888, with capitalization £200,000, shares £2 par; issued, £178,000. Freehold lands include the Tilt Cove mine, at Tilt Cove, Nfld., leased for 99 years to the Cape Copper Co., at an annual rental of £4,400, plus one-half of net profits earned, lease being terminable on a year's notice from the lessees. Has been in litigation with the lessees over matter of profits. Paid dividends of $5\frac{1}{2}\%$ in 1903.

TIMBER PEAK MINING CO.

NEW MEXICO.

Mine office: Socorro, Socorro Co., N. M. Cony T. Brown, manager. Ores carry gold, silver and copper. Has steam power and concentrator.

TINGEN MINE.

NORTH CAROLINA.

An old and presumably idle mine at Roxboro, Person Co., N. C.

TINTIC CO.

UTAH.

Office: Salt Lake City, Utah. Organized 1903, under laws of Maine, with capitalization \$3,000,000, shares \$5 par. Is the parent company of the Tintic Mining & Development Co., Yampa Smelting Co., and West Mountain Tramway Co.

TINTIC MINING & DEVELOPMENT CO.

UTAH.

Office: Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. Organized 1896, with capitalization \$3,000,000, shares \$5 par. Is subsidiary to the Tintic Company, and is managed as a close corporation. Capt. Henry Stern, president; Geo. H. Robinson, general manager; W. J. Craig, superintendent; Jas. W. Neill, consulting engineer and metallurgist. Lands are the Yampa group, area circa 100 acres, near the Utah Consolidated and Boston Consolidated, showing a vein of 10' to 37' width carrying disseminated chalcocite, covellite and chalcopyrite giving average returns of 3.5% to 4% copper and from \$2 to \$5 gold per ton, with considerable silver values. Ores are highly ferruginous, making them valuable for fluxing the silicious ores of the Bingham district.

The mine has about 10,000 of underground openings, being developed by one shaft and two tunnels: The 1,700' shaft has 7 levels and connects at the bottom with the Craig tunnel, through which ore is removed. The Craig tunnel is 3,248' long, striking the main vein at about 2,200' and connecting at 2,448' with the shaft. It is planned to install electric traction in the Craig tunnel. The upper, or Yampa tunnel, intersects the shaft at 475' and runs about 1,000' on the vein, ore from the Yampa being sent down the shaft to the Craig tunnel. Machinery plant includes 7 and 10-drill Rand air-compressors and a hoist actuated by compressed air.

The smelter, near the mine and connected therewith by an aerial tram, has a 250-ton Allis-Chalmers water-jacket furnace, with bins, power plant,

dust-flues, and is planned for two 250-ton furnaces. A second furnace is being installed and should be blown in early in 1905. The first stack was blown in Jan. 30, 1904, and treated about 200 tons daily for the first few months. The smelting plant includes blast furnace and roaster buildings, latter said to have 6 roasters. The main stack is 287' from tuyeres to top. Product is a high-grade matte with large gold and silver values—a matte thoroughly typical of the rich Bingham district. The property is well managed; and none of the Bingham mines have been developed more sensibly, time having been taken to secure ample underground openings before building the reduction plant. Production for 1904 is estimated at 3,000,000 lbs. fine copper.

TINTO MINE.**AUSTRALIA.**

Mine office: Murrin Murrin, Western Australia. A promising property, carrying ore giving assays of 16% copper, 20 oz. silver and 1 oz. gold per ton. **SOCIEDAD LE LAS MINAS DE COBRE TINTO y SANTA ROSA. SPAIN.**

Office: Rue Archimedes, 1, Brussels, Belgium. Mine office: Zalamea la Real, Huelva, Spain. Capitalization 3,000,000 francs. Lands, 114 hectares, including El Tinto, Santa Rosa and 9 other old mines. Has a 7-kilometre aerial tram to Calañas. Properties are leased to the United Alkali Co., Ltd. **TIPTON COPPER CO. NEW MEXICO.**

Letter returned unclaimed from Tularosa, Donna Ana Co., N. M.

TIP TOP COPPER CO.**ARIZONA.**

Office: Commonwealth Bldg., Philadelphia, Pa. Western office: 7 Coles Blk., El Paso, Texas. Mine office: Helvetia, Pima Co., Ariz. Employs 30 men. Organized 1902, under laws of Arizona, with capitalization \$1,150,000, shares \$1 par. John Tarner, president; S. Charles Pratt, vice-president; S. Charles Pratt, vice-president and general manager; Geo. M. Aman, secretary and treasurer; B. B. Nieding, superintendent. Lands, 24 claims, area 400 acres, including the Tip Top and Copper Duke claims, also 100-acre millsite in the Helvetia district, showing 3 contact veins, averaging 14' width, giving average assays of 5% copper, 1 oz. silver per ton and a trace of gold, from carbonate and sulphide ores, opened by 7 shafts, of 10' to 150' depth and several tunnels, longest 958', with about 4,000' of underground openings. Has gasoline power and has developed considerable ore. Is shipping about 1,000 tons of sulphide ore monthly to smelter at El Paso. Management seems good and property is considered promising.

TIP TOP COPPER CO.**NEW MEXICO.**

Office: Metropolitan Blk., Milwaukee, Wis. Mine office: Silver City, Grant Co., N. M. Capitalization \$2,000,000. Dr. V. F. Mueller, president; P. T. McGrath, vice-president and general manager; Geo. W. Kliegel, secretary; Fritz Bock, treasurer. Lands, 4 claims, area circa 70 acres, lying near the Comanche and Burro Mountain groups, showing promising outcrops of both high and low grade ores. Management considered honest and property regarded as promising.

TIP TOP MINE.**IDAHO.**

Office: care of J. Q. Packard, general manager, Worthington Bldg., Salt

Lake City, Utah. Mine office: Doniphan, Blaine Co., Idaho. J. A. Lusk, superintendent. Lands, 12 patented claims, area 220 acres, in the Hailey district, developed by shafts of 500' and 1,000', with 7,000' of underground openings. Has a complete steam plant, 20-stamp mill and 50-ton cyanide plant, working cupriferous gold ores.

COMPANIA MINERA DEL TIRO GENERAL, S. A. MEXICO.

Offices: 2A, Ojo Caliente No. 8, Aguascalientes, Mex. Mine office: Charcas, San Luis Potosi, Mex. Organized 1902, under laws of Mexico, with capitalization \$375,000 Mexican, shares \$100 par. J. G. Creveling, Jr., president and general manager; W. F. Layer, vice-president; G. B. Wardman, secretary and treasurer; L. R. Budrow, superintendent; DeWitt Creveling, assistant superintendent; P. Fuentes, engineer; Wm. Mueller, mine foreman. Lands, 71 pertenencias, area 176 acres, also a ranch.

Mine is opened exclusively by shafts, of which there are 8, the deepest being 130 metres and 277 metres. The property is old and has very extensive underground openings, developed on two main systems, each having one large vein and several smaller veins. The north zone shows a main vein of 3 to 12 metres in width and the south vein workings are idle, pending establishment of a concentrating plant adapted to the ore. Ore blocked out is estimated at 136,000 metric tons, carrying an average of 2% copper and 431 grams silver per ton, of which upwards of 100,000 tons will average not less than 2.5% copper and 475 grams silver. Copper occurs exclusively as a sulphide. Mine has partial steam power plant, using considerable animal power, which will be replaced by machinery during 1905. The concentrator has 10 jigs, tables, and other necessary machinery. The stockholders of the company own a private railroad of 15 kilometres, 30" gauge, with 30-lb. rails, running from the mine to the station at Los Charcos. This has two locomotives, 2 passenger cars and 16 freight cars, and handles 300 tons diurnally, working days only.

Buildings at the mine are of stone, exceptionally well constructed. The present ore production averages about 4,000 tons monthly, and is expected to reach 5,000 tons by latter part of 1905. Ore is sold to the American Smelting & Refining Co. Since September, 1902, the company has paid \$200,000 for this mine, and has built a railroad and made other improvements costing somewhat over \$200,000 more, out of earnings. Dividend payments of \$15,000 per month, Mexican, were begun January, 1905, in addition to which \$5,000 monthly is set aside as a fund for a new concentrating plant or lixiviation works. The company plans the installation of heavy hoists and other machinery and the deepening of two shafts and opening of new levels, also the installation of some form of concentration or lixiviation during 1905. At present this company is the largest shipper to the Aguascalientes plant of the American Smelting & Refining Co. Production in 1904 was 22,345 kgs. silver and 875,005 kgs. fine copper. Company has an excellent management and is a property of proven worth, with an exceptionally bright future.

SOCIETE ANONYME MINES METALIQUES DE TOLOSA. SPAIN.

Offices: Monceau les Mines, France. Mine office: Leiza, Navarra, Spain.

Capitalization, 715,000 francs, in 1,430 shares, par 500 francs. Property is iron mines in Guipúzcoa, and lead-copper sulphide mines at Navarra, latter including the Regina and other mines, which are undergoing development, and are not yet producers.

TOLTEC CONSOLIDATED MINE.**MICHIGAN.**

Office: care of Alfred Meads & Sons, Marquette, Mich. Lands, 320 acres, at Greenland, Ontonagon county, Michigan. Production, 1851-1860, was 206 tons, 1,443 lbs.

TOM HAL MINING CO.**WASHINGTON.**

Mine office: Pateros, Wash. Thos. B. Warren, president and general manager. Lands, 5 claims said to show a 4' to 10' vein, carrying auriferous and slightly argentiferous chalcopryrite, arsenopyrite and iron pyrites. Has steam power, and is a dead beat.

TOM MOORE CONSOLIDATED MINING CO.**COLORADO.**

Mine office: Eureka, San Juan Co., Colo. S. G. Martin, superintendent. Ores carry gold, silver, lead and copper. Has water power.

TOMAHAWK COPPER & ZINC MINING CO.**ARKANSAS.**

Offices: 130 Broadway, New York and 28, St. Swithin's Lane, London, E. C., Eng. Organized Nov. 16, 1899, under laws of Arizona, with capitalization \$1,000,000. Chas. E. Welloone, president; R. A. Blair, secretary. Lands include the Tomahawk copper mine, and sundry zinc claims, in Marion and Searcey counties, Arkansas. Two 100-ton mills are said to be under construction.

TONOPAH-ALOHA MINING CO.**NEVADA.**

Office and mine: care of W. D. Nelligan, president, Tonopah, Nye Co., Nev. F. W. Johnson, secretary. Organized 1903, under laws of South Dakota, with capitalization \$1,000,000, shares \$1 par. Lands, 6 claims, in the Lone Mountain district. Has secured ores assaying up to 12% copper and \$60 gold per ton.

TONOPAH-UTAH MINE.**NEVADA.**

Mine office: care of J. L. Justice, manager, Tonopah, Nye Co., Nev. Has secured assays of 9% copper, 42 oz. silver and \$6 gold per ton.

TORCH LAKE MINING CO.**MICHIGAN.**

Office and mine: care of W. W. Stockley, Hancock, Houghton Co., Mich. Capitalization \$500,000, shares \$25 par. Lands, 1,280 acres, midway between Calumet and Lake Linden, slightly prospected, 1899-1900, by diamond drill borings.

TORPEDO MINING CO.**NEW MEXICO.**

Office: 135 Adams St., Chicago, Ill. Mine office: Organ, Donna Ana Co., N. M. Geo. E. Wood, president; Harvey E. Rich, secretary; C. B. Rogers, superintendent. Lands adjoin the Copper Bar. Has steam power and good machinery equipment, and has produced upwards of 4,000 tons of ore.

COMPANIA METALURGICA DE TORREÓN.**MEXICO.**

Office and works, Torreón, Chihuahua, Mex. Ernesto Madero, president; Carlos Gonzalez, secretary; Donald R. Morgan, mine superintendent;

E. Harmes, smelter superintendent. Has steam power, and 1,000-ton smelter, later with concentrator and briquetting plant. Company employs a large force and plans increasing its reduction plant and establishing sampling works at various mining camps tributary to Torreón. Production, 1903, was 874,346 lbs. fine copper.

TOSTON COPPER COMPANY.**MONTANA.**

Office: Pennsylvania Bldg., Butte, Silver Bow Co., Mont. Mine office: Toston, Broadwater Co., Mont. David J. Charles, president; Emil H. Renisch, vice-president; John A. Shelton, secretary; W. K. Edwards, general manager. Organized Dec. 24, 1903, under laws of Arizona, with capitalization \$1,250,000, shares \$5 par. Lands, 6 claims, area 120 acres, showing 3 fissure veins in porphyry, with a 200' shaft in a vein of about 15' average width, carrying chalcopryite assaying 6% copper, 1 oz. silver and \$2 gold per ton.

TOTTENVILLE COPPER CO.**NEW YORK.**

Office and works: Tottenville, Staten Island, N. Y. Are copper manufacturers only.

TOWADA MINE.**JAPAN.**

Owned and operated by the Fujiti Gummi.

TRAINER MINE.**COLORADO.**

Mine office: Ascroft, Pitkin Co., Colo. Michael Hogan, owner; Wm. P. Greene, superintendent. Ores carry silver, lead and copper.

TRAMWAY MINE.**MONTANA.**

See Snohomish and Tramway for description.

TRANSVAAL COPPER CO.**MEXICO.**

Office: 1408 Traction Bldg., Cincinnati, Ohio. Mine office: Cumpas, Sonora, Mex. Employs 475 men. Organized December, 1901, under laws of West Virginia, and reorganized July, 1903, with capitalization \$6,200,000, shares \$10 par; issued, \$4,200,000. F. W. Fink, president and general manager; R. A. Koehler, vice-president; O. C. Rasch, secretary; Alfred Vogeler, treasurer; L. G. Cloud, consulting engineer; preceding officers, Louis J. Hauck, J. M. Eilers, Louis Hehman and B. Freiberg, directors; O. L. Neer, superintendent; Dr. A. Sandberg, smelter superintendent; James T. McDonald, mine superintendent; W. F. Neihart, cashier.

Lands, 794 pertenencias, area 1,966 acres, also 50-acre smelter-site and 25,000 acres of timber and grazing lands, in the Moctezuma district, showing 8 ore bodies, occurring as fissure veins and lenses, on which 16,000' of development work have been secured. The Cobre Rico vein is opened by 2 shafts and 2 tunnels. Shaft No. 1, 200' deep, shows ore averaging 8% copper, 4 oz. silver and \$1.50 gold per ton. Shaft No. 2, 140' deep, gives similar assays. Tunnel No. 1, length 135', gives ores averaging 9% copper, 3 oz. silver and \$1.50 gold per ton. Tunnel No. 2, 600' long, gives average assays of 4% copper, 3 oz. silver and \$1.50 gold per ton. A large amount of ore has been exposed on this vein, which is very wide.

Transvaal No. 1 has 2 shafts and one tunnel. No. 1 shaft, 210', is in ore. Shaft No. 2, the working shaft, is 318' deep, with steam hoist, 2 Cameron

pumps, two 80-h. p. boilers and a Sullivan air-compressor. Levels have been opened on the 300' lift and considerable ore blocked out, this averaging 3% to 8% copper, 3 oz. to 4 oz. silver and \$1.00 to \$1.50 gold per ton.

The Buckeye mine, with about 2,500' of openings, has a vein ranging 18" to 4½' wide, assaying 12% to 20% copper, 10 oz. to 35 oz. silver and \$1.50 gold per ton, with 2,000 tons mined and 2,500 tons ready for stoping.

The San Nicolas has a 250' shaft in a 4' vein carrying silver-lead values averaging about \$45 per ton, with about 3,000' of openings and 6,000 tons blocked out for stoping. The mine has a steam hoist, two 80-h. p. boilers and a Sullivan air-compressor.

The Virginia gold mine carries a vein said to average 15' width and to carry average values of about \$12 per ton in gold, developed by about 1,000' of openings.

The copper and silver-lead ore bodies occur as fissures, and also as wide, mineralized dykes in trachyte and rhyolite. Copper ores are mainly bornite and chalcopyrite, with occasional chalcocite and the usual oxide and carbonate ores on the outcrops. The ore bodies of the Cobre Rico and Transvaal are mineralized dykes of great width, apparently 200' to 300', carrying low-grade copper sulphides, associated with iron pyrites and having a quartzose gangue, hence liable to prove silicious and require heavy fluxing. The Cobre Rico and Transvaal No. 1 are estimated by the company to show about 2,500,000 tons of low-grade ore available.

Work was begun January, 1902, and has been continued vigorously and uninterruptedly since that time, with forces of 200 to 500 men. Miscellaneous buildings include an engine-house, boiler-house, shaft-house, office, assay-office, boarding-house, 22x90' general store, and 6 dwellings. Nearest railroad is the Nacozari line, 45 miles distant, but the Cananea, Rio Yaqui y Pacifico is surveying a projected line into this district.

A 35-ton reverberatory furnace has been erected at the Buckeye mine, and this was making, in February, 1905, about 7 tons daily of matte averaging 65% copper, 55 oz. silver and \$7 gold per ton.

The main smelter-site is at Cumpas, 15 miles from the mines, and it is planned eventually to build, at this point, reduction works having both lead and copper stacks, with a daily capacity of about 1,000 tons, to be connected with the mines by a narrow-gauge line which will traverse a rugged country and will be neither easy nor cheap of construction. It is necessary, however, that the main smelter be located at Cumpas, where there is a good site and ample water supply. A start is being made on the big reduction plant with a lead stack, now building. The lead smelter will have one 150-ton 42x120' steel water-jacket lead furnace, 54" high, one 16x60' reverberatory furnace, three 80-h. p. boilers, with Worthington feed-pumps, condenser, feedwater-heater, Connorsville blower and tandem-compound engine, steam-turbine and electric generators, sampling plant and machine shop, with steel furnace building and 5 other buildings.

The management of the Transvaal company is composed of solid business men, who have their own money in the venture. Development has

been well directed and the property gives promise of making a large and successful producer of copper, lead and silver. Stock has been withdrawn from the market.

TRANSVAAL COPPER CO., LTD.

Offices: 19-21, Queen Victoria St., London, E. C., Eng. N. F. Nalder, secretary. Location of lands, if any, unknown.

COMPAGNIE DES MINES DE TRANSYLVANIE.

HUNGARY.

Mine office: Brussels, Belgium. Organized 1903, with capitalization 2,000,000f., to develop mines of copper, lead, zinc, ochre, and coal, in Hungary.

GEWERKSCHAFT TRAUTENSTEIN.

GERMANY.

Mine office: Benneckenstein in Harz, Braunschweig, Germany. A. Polednick, manager. Has 2 shafts, the Gertrude of 36 metres and the Silber-Marie of 162 metres, developing ores carrying zinc, lead and copper. Employs 30 men.

TRAVERSELLA MINES, LTD.

ITALY.

Voluntarily wound up, December, 1902.

TRAVONA MINE.

MONTANA.

Office and mine: care of Hon. W. A. Clark, owner, Butte, Silver Bow Co., Mont. Martin Buckley, superintendent. Is an old property in the south-eastern part of Butte, originally a silver mine.

GEORGE A. TREADWELL MINING CO.

ARIZONA.

Office: 27 William St., New York. Mine office: Mayer, Yavapai Co., Ariz. Employs about 50 men. Has 1,584 shareholders—mostly fools. Organized 1899, under laws of West Virginia, with capitalization increased, Jan. 21, 1905, to \$3,500,000, shares \$10 par. Prof. Geo. A. Treadwell, president; Walter S. Logan, vice-president and treasurer; Miss Myra B. Martin, secretary; Erwin D. Treadwell, general manager; Napoleon Walmeyer, mine superintendent; Bertram L. Smith, smelter superintendent.

Lands, 102 patented claims, area 1,861, acres, also 260 acres of mill and smelter sites and 30 acres miscellaneous lands, giving total holdings of 2,151 acres, in the Verde, Big Bug, Peck and Black Canyon districts, supposed to be held under a \$200,000 bond and lease, partially paid. Country rocks are magnesian slate and rhyolite, ore bodies occurring as replacements in the slate, following rhyolite intrusions. Five ore bodies have been developed to various extents, these averaging 5' width and being claimed by company to give average assays of 5% copper, 5 oz. silver, and \$5 to \$50 gold per ton, from chalcopryite. Formation has a generally east and west strike, with dip of 60° to 80° southward. Ores are claimed by company to be self-fluxing. Lands include the Brookshire, Iron Queen, Cliff, Hackberry, Boggs, Badger, Pastime, Crystal, Wallace and Agua Fria groups. Principal development is on the Brookshire group, opened by a 280' shaft and 1,680' of tunnels, with about 700' of drifts, showing a concentrating ore that should average 5% or upward in copper, with substantial gold and silver values. The Iron Queen mine has a 360' shaft and 1,300' of drifts. The Boggs mine has a 350' shaft, with 1,100' of drifts; the Hackberry has a 400' main shaft, with about 1,500' of drifts and is claimed to have parallel 9' and 7' veins, latter running 10% cop-

per and \$10 gold per ton. The Cliff is opened by 1,400' of tunnels, and the other properties have about 1,000' of miscellaneous shafts, drifts and tunnels. Mr. E. D. Treadwell estimates that 60,000 tons of ore have been blocked out for stoping.

The mines have a 160-h.p. steam equipment, and the old smelters have 40-h. p. steam and 80-h. p. water plants. The mine has four 40-h. p. hoists, good for 500' each, and a three-drill Rix air-compressor, with 3 power drills. A 50-ton concentrator, 50x150', of wood, has one 7x10" Blake crusher, one centrifugal crusher, 2 trains of rolls, 7 Hartz jigs, 2 Bartlett tables, sizers, screens, elevator, etc. The company has a 3-mile narrow-gauge railway touching the Hackberry, Boggs and Queen mines, and connecting, at Arizona City, with the Santa Fé, Phoenix & Prescott Railway, which reaches the new smelter site at Mayer.

The old Boggs, or Commercial, smelter is of 80 tons daily capacity, with a calcining furnace and two 40-ton water-jacket blast-furnaces, connected with the Hackberry mine by a narrow-gauge tram-line, a 5-mile pipe-line supplying water. A new smelter was built at Arizona City, which was called a hydrocarbon smelter, and had the approval of Prof. Geo. A. Treadwell, the "eminent" scientist at the head of the company. It was heralded as a great success by the company, in its misleading serial advertisements, and "a little more stock" was sold on the strength of this revolutionary metallurgical invention, but it turned out to be a flat failure and has been abandoned. Company now is building a new smelter, at Mayer. This, probably thanks to Erwin D. Treadwell, who is the only director of the company with horse-sense, is built along sane lines. The plant is designed for 500 tons ultimate capacity, with a 250-ton Mitchell economic hot-blast furnace, 42x120" at the tuyeres. The new plant should be completed reasonably early in 1905, and seems to be well planned. The location is good, for custom smelting purposes, and the smelter will have a good territory to draw from, especially since the burning of the Val Verde smelter has eliminated near-by competition.

Capitalization of the company was increased by \$500,000, Jan. 21, 1905, ostensibly to secure funds "to buy ore". Inasmuch as the advertisements of this company have claimed for years that the company's mines had "immense bodies" of very rich ore ready for mining "as soon as a smelter could be provided," and inasmuch as one smelter was built and proved a flat failure, the management of the Treadwell company must be convinced that the United States is populated mainly by idiots. Early in 1904 the company claimed to have 40,000 tons of ore blocked out in the Iron Queen mine that would average 8% copper, and \$7 to \$10 gold per ton—yet the Treadwell people, with unblushing effrontery, now ask for more money to buy ore.

For some years past the financial columns of the leading American daily papers have contained the modest 6-inch advertisements of the George A. Treadwell Mining Co. These have been well-written, interesting and full of deliberate lies, told to separate fools from their money. Prof. Geo. A. Treadwell, held up as the father of successful mining in the southwest,

was never rated as more than a star of the fourth magnitude in the country where his alleged successes were supposed to have been made. Erwin Treadwell is generally liked in the southwest. His misfortune consists in being connected with the company. The she-secretary of the company signs all the advertisements, and while it may be ungallant to call attention to the fact that these advertisements were—and yet are—peppered with lies as thick as raisins in a plum pudding, the woman who has been instrumental in draining something like a million dollars out of the pockets of the credulous, under false pretenses, must expect to be rapped over the knuckles occasionally, especially when her associates of the male sex take refuge behind her petticoats.

MINA TRES GRACIAS.

CHILE.

Office and mine: Chañaral, Atacama, Chile. Basilio Caceres, owner; Roberto Caceres, manager. Has steam power and employs about 100 men.

TREVEDDOE MINING CO., LTD.

ENGLAND.

Offices: 13, Throgmorton Ave., London, E. C., Eng. Mine office: Bodmin, Cornwall, Eng. J. Morris, chairman; W. H. Adams, secretary. Organized Aug. 13, 1900, with capitalization £100,000, shares £5 par; issued, £95,000. Debentures, £7,500 authorized, £5,500 outstanding, at 5%. Lands, 500 acres, held on 100-year lease, subject to rental and royalty, bearing tin and copper ores. Production in 1902 was 60 tons of black tin and 175 tons of 7% copper ore.

TREVINO y ZERTUCHE.

MEXICO.

Office and mine: Viesca, Coahuila, Mexico. Lands include several groups of mines carrying gold, silver, lead, copper and iron. Idle.

TRI-BULLION SMELTING & DEVELOPMENT CO.

ARIZONA.

Office: 640 First Natl. Bank Bldg., Chicago, Ill. Mine office: San Carlos, Gila Co., Ariz. Employs 45 men. Organized 1903, under laws of Arizona, with capitalization \$5,250,000, shares \$1 par. Hon. Howard Paschal, president and general manager; J. P. Hendricks, secretary and treasurer; Joseph C. Erman, superintendent; Jas. Camp, foreman. Lands, 16 claims, area 320 acres, in the Stanley Butte district, 8 miles south of San Carlos. Mine was discovered 1886, but lands were set aside later as part of the San Carlos Apache Indian reservation, and were not segregated until 1901. Lands show 3 lenses, averaging 20' width, carrying oxide and carbonate ores giving average assays of 8% copper, 10 oz. silver and \$4 gold per ton, and also carrying lead, zinc, antimony and bismuth. Mining work was begun January, 1903. Country rocks are quartzite, porphyry and limestone. Principal claims are the Starlight and Will Ryan. The Starlight has shafts of 140' and 210', and a tunnel, to cut the main vein at depth of 500' at a distance of 1,000', which already has cut two other veins showing auriferous and argentiferous copper ore. Survey has been made for a tramline 2,000' long, with a 22% grade, from the Starlight to the wagon road in Kelley Gulch. The Ryan crosscut tunnel, is about 1,200' long. The property has the remains of an old adobe smelter, a hundred years or more of age, showing that the mines formerly were worked by Spaniards. The

company also owns the Michigan gold mine, 7 miles northwest of Ishpeming, Marquette county, Michigan, on which a little work was done in 1903. This property, discovered 1885, while not the largest unquestionably is the richest gold mine in Michigan, having a vein of 18" to 30" width, carrying comparatively barren quartz, with occasional pockets of rich ore assaying up to \$55,000 per ton. It is planned to continue development work and erect a concentrator and leaching plant at the Arizona property, during 1905.

TRIMETALLIC MINING, SMELTING & REFINING CO. MEXICO.

Office: care of P. Sandoval, treasurer, Nogales, Ariz. J. L. Shepard, president. Presumably organized under laws of Arizona. Lands, 9 groups of claims, in the Ures and Hermosillo districts, Sonora, Mexico, with a government concession for the equivalent of about 100,000 miners' inches of water from the Yaqui river which, under an effective head of 160', can be made to develop a very large water power. Ores carry copper, gold and silver. Management considered honest and property of much more than average promise, but development is difficult at present, owing to the rebellion of the Yaqui Indians.

TRIMOUNTAIN MINING CO.

MICHIGAN.

Office: 27 State St., Boston, Mass. Mine office: Trimountain, Houghton Co., Mich. Employs about 800 men. Organized 1899, under laws of Michigan, with capitalization \$2,500,000, shares \$25 par; \$20 paid in. Annual meeting, second Wednesday in February. Wm. A. Paine, president; Frederic Stanwood, secretary and treasurer; F. W. Denton, general manager; preceding officers, Chas. H. Paine, Chas. A. Snow, J. Henry Brooks, John Stanton, directors; John Jolly, mining captain; H. T. Mercer, engineer; Edw. Koepel, mill superintendent; Benj. D. Noetzel, clerk; Jas. Vial master mechanic at mine; James Richards, Jr., master mechanic at mill; Will Harris, supply clerk; Old Colony Trust Co., of Boston, registrar. Control of company was taken over by Copper Range Consolidated Co., which owns practically entire stock issue, in September, 1903. Company has paid dividends of \$3 per share.

Official returns to the state of Michigan, as of date Jan. 1, 1904, disclose the following figures:

Amount cash paid in on capital stock.....	\$1,200,000.00
Amount paid in by conveyance of property to company.....	800,000.00
Entire amount invested in real estate.....	803,000.00
Amount of personal estate.....	2,557,632.04
Amount of floating debt.....	1,174,177.07

Lands, 1,120 acres, consisting of the east half of Section 19, west half of Section 20, north half of Section 29 and northeast quarter of Section 30, all in Town 54 North, Range 34 West. The Baltic lies to the north and the Champion to the south, with undeveloped lands east and west. The Trimountain has a very heavy and overburden surmounting the ledge, hence it was no simple matter to sink shafts, the mine being opened by sinking drop-shafts through the sand and crosscutting to the lode, raising thence to surface on the angle of the lode. The Baltic bed runs 15' to 50' wide on the Trimountain tract, with an average width of about 25', the lode being well mineralized across its entire width, mass and barrel copper occurring near

the walls. Masses upwards of a ton in weight have been found, but principal values are in the stamp-rock. Shafts are all of the same size and style, being 8x22' outside of timbers, with three compartments, framed with 14x14" beams, exceptionally heavy timbering being required to withstand the pressure from the shifting sand above the solid rock. Development of the mine was begun in 1899.

Shafts 1, 2 and 3 have 2,500-h. p. Nordberg direct-acting duplex hoists, with 36x72" cylinders, and 18' double-conical drums, capable of raising 6-ton skips from a depth of 5,000', and No. 4 is to have a similar hoist eventually. Shafts 2, 3 and 4 have duplicate shaft-rockhouses, 40x62' on the ground and 84' high, with steel frame and corrugated iron sides and roof, each equipped with engine, steam-hammer and two 18x24" crushers, with room for two additional crushers of the same size, and 2,000-ton storage bins. No. 1 has a wooden shaft-rockhouse.

Lying parallel with and about 65' west from the Baltic lode is a very wide amygdaloid, carrying some heavy copper and considerable stamp rock. This has been opened by a crosscut from the 7th level of No. 1 shaft, and has been explored to some extent, but nothing of great importance found.

No. 1 shaft, 1,040' deep, sunk at an angle of 68°, is about 210' north of the Champion boundary line. This shaft has a sand overburden of about 40', with first level opened 168' below the collar, levels being 100' apart from thence downward, developing a long stretch of exceptionally uniform stoping ground of high grade.

No. 2 shaft, 1,023' northeast of No. 1, is 976' deep, and sunk at an angle of 68°, with practically the same equipment throughout as at No. 1.

No. 3 shaft, 1,027' northeast of No. 2, sunk at an angle of 68°, is 930' deep, with a sand overburden of about 60'. Ground is much disturbed above the second level, but the formation becomes more regular at greater depth, showing many good stopes. Sinking is to be resumed in this shaft.

No. 4 shaft, 470' deep, went into commission October, 1903. This shaft has a temporary hoist good for a depth of 1,300', and is showing good ground. Sinking is to be resumed early in 1905.

Shafts 5 and 6 are in embryo. At the site of No. 5 is a sand overburden, mixed with boulders, 238' in depth, which will prove costly and tedious to penetrate. No. 6 will develop the Trimountain territory to the Baltic line. Underground the great average width of the lode has presented some problems for solution that are peculiar, in the Lake Superior district, to the Trimountain, and its neighboring mines, the Baltic and Champion, opened on the same bed. Dry-walling with waste-rock is used extensively and has proven its value, though at first assailed as a fad. Another departure of interest is the building of rock-chutes from waste mine-rock. These are roughly circular, with inner diameter of about 5', and are built up and filled about with waste as the stopes are carried upward, the chutes being built up at a sharp pitch. It was feared that descending rock might catch upon projections of the inner wall, built of rough mine-rock, but in practice no such trouble has occurred, the wedging of the surrounding waste rock

serving to hold the walls immovable. The saving in timbering from the use of dry-walling and mine-rock chutes is very great, and the matter is one worthy of investigation by such other mines of the district as are so situated that a similar system could be put in use.

The principal mine buildings and machinery are in the neighborhood of shafts 2 and 3. The machine shop is 32x45', carpenter shop 40x60', smithy 25x45' and warehouse 30x60', the shops being supplied with modern machinery and tools. There is a 35-drill cross-compound Rand air-compressor at No. 2 shaft, with a Deane condensing plant in a separate building adjoining. At No. 3 shaft the power plant is housed in a 68x180' steel building, the plant including a battery of Stirling water-tube boilers and a 4,500' Nordberg air-compressor bought from the Arcadian mine. This machine, guaranteed to run 45 drills only, actually is running 65 drills, 10 pumps and sundry pneumatic machinery, giving a total duty equal to running 90 drills, or twice the rated capacity. At No. 3 there is a large coal trestle, supplying fuel to the boiler-room, and a cistern near No. 2 shaft stores water from a small brook for the boilers. A house over the cistern has a fire pump, with hose, for defense of the mine buildings from fire.

The company has upwards of 100 good dwellings at the mine location, all new, also a large boarding-house and store. The location is growing rapidly and is improved with well macadamized roads. The mine is served by the Painesdale branch of the Copper Range railroad.

The 100-acre millsite, at Beacon Hill, 2 miles west of Redridge, has about one mile frontage on Lake Superior. The mill is 176x205', of steel on stone foundations, equipped with 4 Nordberg stamps, the washing machinery for each stamp consisting of 36 improved Hodge jigs, 6 slime tables and one Wilfley table, with a small but complete machine shop for repairs on the second floor. The steel boiler-house has four 250-h. p. Stirling water-tube boilers, with a brick-lined self-supporting steel smokestack, 7' 6" in diameter and 165' high and an addition is being built for 2 more 250-h. p. Stirling boilers. At the rear of the boiler-house are 3 coal trestles, under each being a 6x7' tunnel 400' long leading to the boiler-rooms, the floors of the sheds forming the roofs of the tunnels. Feed water for boilers is piped from a dam across a small stream 1,000' distant.

The steel pump-house at the millsite has a 20,000,000-gallon Nordberg pump taking water from a well connected with a 40" riveted steel pipe, running 1,400' to an intake crib in Lake Superior. The crib, which is built of heavy timbers braced by iron rods, is 42x56' on the bottom and 31' high, sunk in 21' of water, weighted with 1,800 tons of rock and anchored into the sandstone bed of the lake by heavy iron rods. The 40" water-pipe is laid on the floor of the lake from the crib until shallow water is reached and anchored to the rock bed of the lake by eye-bolts. The 500' of this line nearest shore lies in a 14' trench covered with cement sunk in sacks. Miscellaneous buildings at the mill include a smithy and carpenter shop, each 18x30', and a 24x36' warehouse. The townsite of Beacon Hill, lying on the slope above the mill, has a number of dwellings, the townsite and mill buildings being

lighted by electricity supplied by a dynamo in the engine-room of the mill.

The Trimountain began production Jan. 4, 1902, with one leased head at the Arcadian mill, starting a second leased head in April. The first two heads in the Trimountain mill were started in 1902, and when the third and fourth heads were started in 1903, use of the Arcadian mill was discontinued. Production began with 37 lbs., fine copper per ton, but fell off later to 27 lbs. per ton. When the present management assumed control the production fell sharply, from 27 lbs. down to 18 lbs. per ton, but again has gotten above 20 lbs. The reason for this sudden decrease in percentage is not far to seek. Thomas W. Lawson, the self-appointed guardian of speculators, and the immaculate critic of financial crookedness in high places, was the owner of a majority of the Trimountain stock, and forced the old management to operate the mine on a radically wrong basis. The mine was gouged, rich rock removed and production maintained at a high level through wilfully robbing the mine, at the expense of the future. By these tactics dividends aggregating \$300,000 were squeezed out in 1903, yet the mine was turned over to the Copper Range with a floating debt of upwards of \$750,000. The Lawson management is blighting, because fundamentally opposed to sound sense and honesty. The Trimountain was rescued from his corrupt dictation in time, and under the honest and capable management now enjoyed, is slowly but surely getting back to the sound position it merits. Notes aggregating about \$730,000, assumed when the mine was taken over, have been very largely liquidated, and by 1906 the Trimountain will have gotten in such shape, physically and financially, that it can increase production, increase the percentage of copper in rock stamped, and earn very handsome profits. The present general management is both honest and capable, and the local management is notably efficient.

TRINITY COPPER CO.

CALIFORNIA.

Office: 33 State St., Boston, Mass. Mine office: Kennett, Shasta Co., Cal. Forces, one \$10,000 general manager and two \$3-a-day watchmen. Organized 1900, under laws of New Jersey, with capitalization \$6,000,000, shares \$25 par. Thos. W. Lawson, president; Wm. Riley, vice-president; Homer Albers, secretary; Allen Arnold, treasurer; preceding officers, Louis Auerbach, Arthur P. French, Henry H. Arnold, Frank E. Chase and Kenneth K. McLaren (McLaren is a New Jersey guinea-pig, who is a "director" in a vast number of New Jersey corporations, good, bad and indifferent) directors; Austin H. Brown, general manager; American Loan & Trust Co., of Boston, transfer agent; International Trust Co., of Boston, registrar.

Lands, 1,700 acres, also a 422-acre smelter-site and a patented townsite, near Kennett, giving a total area of 3,655 acres. Principal mining lands are the Shasta King and King Copper groups. The Shasta King group, 12 claims, is 4 miles east of Iron Mountain, on the south fork of Squaw creek, adjoining the Balaklala mine. Development is by tunnels, main tunnel being 7x8' and 1,145' long, with double tram tracks and a 7x8' double-track tunnel has been driven 175' lower. The mine has about 7,400' of underground openings and the tract has been partially explored by 5,119' of diamond drill borings.

Ore body is a lense claimed to be approximately 150' wide by 1,000' long, of unknown depth, said to give evidence of strength and to be likely to prove persistent to good depth. The mine is claimed by the management to have 1,200,000 tons of ore in sight, with nearly 500,000 tons blocked out for stoping, but this statement is denounced by Lewis W. Aubury, state mineralogist of California, who is a competent authority and an honest man, as a gross and wilful prevarication. The crosscut tunnels, driven in from the sides of the mountain, are connected by drifts in the ore body. Ore is a low-grade disseminated chalcopyrite, averaging somewhere between 2% to 4% copper, with about \$1 gold and silver values per ton. Rumors have been printed that the ore body is merely a blanket vein, pinching out just below present workings, but best evidence is that the ore body is a lense of unknown but probably considerable depth.

The King Copper group of 22 claims, about $2\frac{1}{2}$ miles south of the Shasta King, has about 1,000' of development work, no ore having been found in place as yet. The Statesman group has been explored, with a view to locating and developing silicious ores required for fluxing. The Uncle Sam group, held under option and lease by the Trinity, also has been explored for fluxing ores, the Trinity having large bodies of low-grade cupriferous iron-sulphides, but lacking the silicious ores required to make free-smelting furnace mixtures. Some oxidized ore has been found at and near surface, this running 3% to 8% in copper tenor. Surface improvements include a \$20,000 office building, assay-office, hospital, warehouse, shops and about 25 dwellings for employees. The operating plant has steam power, a 6-drill air-compressor, power drills and one diamond drill. The smelter-site, at Kennett, is 8 miles from the mine, with which it is connected by railroad. Grading for 750-ton reduction plant was discontinued, 1901.

At the company's annual meeting, February, 1905, the president, Lawson, was authorized to build a smelter "according to specifications submitted by general manager Brown." There is considerable speculation as to what has become of the \$972,000 of working capital intrusted to president Lawson several years ago. No financial statement has been vouchsafed by the virtuous Lawson for several years. Presumably he has been too busy writing magazine articles attacking the Amalgamated Copper Co., since he became too stenchful for the olfactories of even that hardened lot of market-riggers. In order to find funds to build the new smelter the Boston Stock Exchange kindly permitted Lawson to list the balance of the Trinity stock, amounting to 80,000 shares, early in 1905. The Boston Stock Exchange has enjoyed an exceptionally good reputation heretofore, but this matter of listing such utterly rotten stock as the Trinity is calculated to shake faith in the exchange. What the Boston Stock Exchange needs—and needs badly—is enough courage to back up its honest convictions.

In the prospectus of the Trinity Copper Co., issued Oct. 20, 1900, Lawson predicted that from August, 1901, the net earnings of the company would be "at least" two to three million dollars yearly, and that by that time at least \$30,000,000 worth of ore would be blocked out. The mine is said to have

been bought by Lawson for \$165,000 and a stock consideration, and was capitalized at the modest sum of six millions, that being Lawson's idea of the "square deal" to his followers.

Lawson's mining career is malodorous. He boomed Arcadian at \$75, and later it went to 75 cents. He unloaded Butte & Boston at a fancy price on his trusting employers, the Amalgamated. He gutted Trimountain and paid dividends when the mine owned nearly or quite a million dollars. He did the dirty work for the Amalgamated and now pretends to expose that company. Lawson combines the personal polish of a Chesterfield with the vocabulary of a fishwife, and to the instincts of a horse-thief adds the business methods of a tin-horn gambler. Those who follow him need not be surprised if any are robbed at some turn of the road.

**TRIUMPH GOLD-COPPER CONSOLIDATED, SMELTING,
LAND & IRRIGATION CO.**

A fraud, promoted by the notorious Wernse gang of swindlers.
TROUT CREEK COPPER MINING CO.

Letter returned unclaimed from former office, Tacoma, Wash.
TROY COPPER CO.

ARIZONA.

Merged, 1902, in Troy-Manhattan Copper Co.
TROY GOLD MINING CO.

COLORADO.

Mine office: Granite, Chaffee Co., Colo. G. Falconer, superintendent. Ores carry gold, silver and copper. Has steam power and 20-ton concentrator.

TROY-MANHATTAN COPPER CO.

ARIZONA.

Office: 505 Postal Telegraph Bldg., New York. Mine office: Troy, Pinal Co., Ariz. Employs about 60 men. Organized July, 1902, under laws of Maine, with capitalization \$3,000,000, shares \$10 par; issued, \$2,500,000. Present company is an amalgamation of the Troy Copper Co. and the Manhattan Copper Co., which had adjoining properties. John W. Sisson, president; Vincent P. Tommins, secretary; Chas. H. Cutting, general manager; Thos. Kavanaugh, superintendent; J. C. Devine, mine foreman.

Lands, approximately 1,200 acres, in the Troy district, about 6 miles northeast of Kelvin, with 5 claims more or less developed, principal work being on the Troy property, which includes the Alice and other groups, with aggregate area of 567 acres. The Troy has 4 shafts, including a 500' two-compartment main shaft, with about 7,000' of tunnels. The main working tunnel of the Alice is about 1,700' long, intersecting the lode at a depth of nearly 800'. It is planned to connect the mouth of this tunnel with the smelter by an aerial tram. The various mines have about 30,000' of underground openings. Ores of the Alice are slightly auriferous and argentiferous oxides and sulphides, ranging 8% to 16% in tenor, smelter returns for 1902 having given an average of about 10% copper. Vein is 3' to 11' in width, increasing at bottom of shaft, where it is very soft and requires spilling. The Sisson shaft shows a 6' vein of sulphide ore, apparently a fissure in limestone, said to average about 5.5% copper. The Buckeye winze is said to show a 25' vein of malachite giving smelter returns of 6%

to 10% copper. On the '91 claim there is a body, said to be of considerable size, of wolframite, from which the company plans to produce commercially, a small concentrator having been built for the purpose near the Davis shaft. Equipment includes 2 gasoline hoists, a Leyner air-compressor and an electric plant. Petroleum is used exclusively for fuel. The old 60-ton smelter, at Riverside, on the Gila river was blown in early in 1901 and closed down permanently, August, 1904. The plant never ran regularly and experienced much trouble from shortages of both coke and water. The new smelter was blown in January, 1905, but closed down after 10 days run, owing to serious washouts that prevented receipt of both coke and petroleum. The construction of the Phoenix & Eastern railway to the smelter should enable the company to produce upon a living basis, impossible previously because of a wagon-haul of 75 miles for all fuel and supplies. The past experience of the company and its predecessors has not been of an altogether satisfactory nature, but the present management seems honest and capable, and with a railroad the property has a fair chance of winning success.

TRUE BLUE COPPER MINES, LTD.**BRITISH COLUMBIA.**

Lands, 6 claims, on Houser Creek, Slocan district, British Columbia.

TRUST RUBY MINE.**COLORADO.**

Letter returned unclaimed from former office, Ouray, Ouray Co., Colo.

TSCHOUDAK MINE.**RUSSIA.**

A small producer in the Russian Altai. Ore is chalcopyrite, with quartz gangue, occurring in a vein ranging up to 24' width.

TSUBOI MINE.**JAPAN.**

Mine office: Tsuboi-mura, Kume-gori, Mimasaka, Japan. Ore is chalcopyrite, associated with iron pyrites, averaging 13% copper and 0.2% silver, occurring in three principal veins of 2' to 4' width, running parallel to plane of stratification of paleozoic clay-slate and schalkstein. Production in 1900 was 183,876 lbs. fine copper.

AKTIEN-GESELLSCHAFT TUBALKAIN.**GERMANY.**

Mine office. Adenau, Rheinprovinz, Germany. Has ores of copper, lead and iron. Apparently idle.

TUBUTAMA MINING & REDUCTION CO.**MEXICO.**

Mine office: Tubutama, Altar, Sonora, Mex. Lands, 300 pertenencias, including a number of antiguas, adjoining the Sonora Mining & Milling Co. Property said to be promising. Presumably idle.

TUCK MINE.**VIRGINIA.**

Undeveloped property in Halifax Co., Va. Fully described in Vol. II.

MINA TULIPAN.**CHILE.**

Mine office: Chañaral, Atacama, Chile. Zoilo Rojas, owner; R. Olquin, superintendent. Has steam power and employed 50 men at last accounts.

TULLY COPPER MINING CO.**COLORADO.**

Office: Encampment, Wyo. Mine office: Pearl, Larimer Co., Colo. Organized 1901, under laws of Wyoming, with capitalization \$1,000,000, shares \$1 par. Leo Davis, president and general manager; F. J. Lordier, secretary and treasurer; J. D. Tully, superintendent. Lands, 12 acres,

patented, also a 6-acre millsite, showing 4 fissure veins carrying oxide and carbonate ores, of which one is being developed, this having an average width of 25' and carrying estimated average values of 6% copper and \$4 gold per ton, opened by a 175' main shaft. Has steam power.

TUNABERG MINE.**SWEDEN.**

A Swedish property, producing mainly silver, with lead and copper as by-products. Main shaft, 588'.

TURGOVSKI WORKS.**RUSSIA.**

Mine office: Perm, Russia. D. T. Zaharovski, manager. Production in 1900 was 111,686 lbs. fine copper.

TURK MINING & MILLING CO.**WASHINGTON.**

Office: Davenport, Wash. Mine office: Deer Trail, Wash. Ores carry gold, copper and silver. Employed 15 men at last accounts.

TURNAGAIN ARM GOLD MINING CO.**OREGON.**

Mine office: Cableville, Ore. Is operated by the Killen-Warner-Stewart Co. D. L. Killen, manager. Property is the Cracker-Oregon mine, carrying ores of gold, silver, lead and copper. Has steam power and 10-stamp mill, employing about 30 men.

TURQUOISE COPPER MINING CO.**ARIZONA.**

Mine office: Gleeson, Cochise, Ariz. W. H. McKittrick, superintendent.

TUSAS PEAK GOLD & COPPER MINING CO.**NEW MEXICO.**

Office: 364 River St., Manistee, Mich. Mine office: Tres Piedras, Taos Co., N. M. Louis E. Morris, president; Constantine Fleissner, vice-president; James W. Murray, secretary; Otto Rosenfeld, treasurer. Lands, 11 claims, about 12 miles west of Tres Piedras, in the Bromide district, said to show a 13' vein carrying about 5' of shipping ore and 8' concentrating ore. Ores are argentiferous and auriferous, and are said by company to carry platinum also.

TWENTIETH CENTURY GOLD**ONTARIO & ARIZONA.****MINING CO., LTD.**

Office: 35 Court St., Boston, Mass. Capitalization \$2,000,000, shares \$10 par. Anthony Blum, president; Dr. John Mollath, secretary. Lands include gold property in the Rainy Lake district of Ontario, and copper claims in Cochise county, Arizona. Company paid dividends until January, 1904, but it is not certain that dividends were earned. Gold mines idle. Copper claims ditto.

TWIN BUTTES MINING CO.**ARIZONA.**

Office: care of Hon. David S. Rose, president, Milwaukee, Wis. Mine office: Vail, Pima Co., Ariz. Employs 40 men. Property was bought by present owners, October, 1903, for \$125,000. Lands, circa 30 claims, in the foothills of the Sierrita Mountains, Helvetia district, 28 miles south of Tucson. Property was first opened, circa 1880, but never was successful, although always considered rich. The ore occurs between a limestone foot-wall and granite-porphry hanging-wall. The Copper Glance mine has a 350' main shaft with carbonate ore on the 300' level, and the Morgan mine has a 115' shaft, bottomed in sulphide ore said to average 11% copper, the

upper 45' of the shaft showing copper carbonates. It is said that the management contemplates sinking a 3-compartment working shaft. Mine is said to have about 30,000 tons of medium to high-grade ore blocked out for stoping. Machinery outfit includes hoists and an air-compressor. Water for a smelter can be secured from the Santa Cruz river, 5 miles distant, and company plans installing a new mining plant and building a smelter with a 100-ton water-jacket blast-furnace. The Twin Buttes Railway Co. is said to have been incorporated, October, 1904, for the purpose of building a 27½-mile standard-gauge line from Tucson to the mines. The company is composed of business men of excellent standing, and the property is considered one of merit.

TWIN CITY DEVELOPMENT CO.**COLORADO.**

Office: care of C. O. Patton, secretary and treasurer, Chicago, Ill. Mine office: Turret, Chaffee Co., Colo. W. J. J. Root, president; J. J. New, general manager. Lands, 5 patented claims, known as the Vivandiere group, 13 claims, known as the Twin City group, and the townsite of Minneapolis. Main shaft, 615', with considerable development. Has a concentrator, to be of 50 tons daily capacity when fully equipped, which now treats about 25 tons daily, putting about ten into one.

TWIN-EDWARDS COPPER MINE CO.**NORTH CAROLINA.**

Office and mine: Greensboro, Guilford Co., N. C. Organized September, 1902, with capitalization \$100,000, shares \$100 par. Lands are sundry old properties, including the Twin mine, which was worked previous to circa 1861, and has an 18' vein. Has steam power and employed about 20 men at last accounts.

TWO BIT GOLD & COPPER MINING CO.**COLORADO.**

Supposed to have claims in the Two Bit district of Colorado.

TYEE COPPER CO., LTD.**BRITISH COLUMBIA.**

Offices: 45, Leadenhall St., London, E. C., Eng. Mine office: Duncans, Vancouver Isld., B. C. Works office: Ladysmith, Vancouver Isld., B. C. Employs 120 men at the mine and 100 at the works. Organized April 4, 1900, under laws of Great Britain, with capitalization £180,000, shares £1 par. Thomas Headland Wilson, chairman; Wm. Gardner, secretary; Clermont Livingston, managing director and general manager; Edw. C. Musgrave, mine superintendent; Thos. Kiddie, smelter superintendent. Paid dividends of 10 % in 1903 and 20% in 1904. Lands, 13 claims, crown-granted, area 400 acres, also 45-acre smeltersite, 60-acre tramway terminal and 800 acres timber lands, all in the Somenos district, on Mt. Sicker, about 11 miles northwest of Duncans, and about 80 miles from Vancouver. Country rocks are schists and diorite, carrying a lense in banded schists, the schists themselves carrying up to 2% copper, with small gold and silver values, and being suitable for fluxing. It was thought, in the early stages of work, that three lenses had been discovered, but upon more extensive development, it became apparent that in reality these were one great lense of 20' average width by 1,500' length, and of at least 600' depth. Apparently the Tyee and Lenora are joint owners, the Tyee being the principal shareholder, in a

great lense of upwards of 2,000' in length. This ore body carries an average of 4% copper, 2.5 oz. silver and \$3 gold per ton. It also averages about 38% barium sulphide, and about 6% zinc, rendering the ore refractory in smelting. That it is so well smelted is a great credit to the local management of the company.

The Tyee main shaft, 600' deep, is to be carried to a depth of 1,000'. No. 2 shaft is 200' deep, and No. 3 shaft, on the XL claim, with 2 compartments, is 150' deep, and is to be sunk further during 1905. The mine has about 2 miles of underground openings, and, at the conservative estimate of the management, shows a year's supply of ore. Other observers put the ore reserves at two to four years. Equipment at the mine includes 5 boilers, hoists of 20-h. p. and 50-h. p., 5-drill and 10-drill air-compressors, and a pumping plant raising 100,000 gallons daily in a single lift of 1,800'. There also is a sawmill and an ore-dressing plant at the mine. The latter, at the main shaft, has a No. 4 Gates crusher, Blake crusher, grizzly, rolls, grinders, Snyder automatic samplers and an ore-sorting belt. From the sorting-belt ore is delivered to 100-ton ore bunkers, and thence to a $3\frac{1}{2}$ -mile aerial tram with half-ton buckets operated by a 4-h. p. engine for starting, gravity furnishing the real motive power, there being a drop of 2,000' between the mine and the 400-ton ore bunkers at the lower terminus of the line, on the Esquimaux & Nanaimo Railway. From the lower bunkers ore is carried 17 miles to the smelter in 30-ton bottom-dumping cars. Buildings at the mines include engine-house, boiler-house, smithy, carpenter shop, store, boarding-house and bunk-house, all of wood.

The reduction works, at Ladysmith, are well located, having a 45-acre site on Oyster Harbor. A notable feature of these works is the roast-yard. Ores are dumped from the railroad hopper-cars into sixteen 100-ton receiving bins, with hopper-bottoms and screen-tops, latter set at angle of 40°, all fines under $\frac{3}{8}$ " mesh falling into separate compartments built in the center of each bin. The level of the roast-yard is about 8' below the tram tracks running under the receiving bins. The yard has 6 permanent trestles, 60' apart from center to center, and at right angles to the permanent trestles are 6 trenches, each 4' deep and 40' from center to center. Between the permanent trestles are movable bridges traveling on wheels, these being trussed so as to clear the roast-heaps below. Both permanent trestles and movable bridges have tram-tracks, with turntables, over which travel side-dumping ore-cars, which thus can obtain easy access to every square foot of the roast-yard. Roast-heaps are built up automatically by dumping the tram-cars, each heap averaging 24x50' size on the bottom, by 7' height, and containing an average of 300 tons. Each roast-heap requires an average of 8 cords of wood, and burns about 3 weeks, reducing sulphur contents to about 5%. The system works perfectly, cinder being reduced to a minimum. When roasted, ore is shoveled into $2\frac{1}{4}$ -ton ore-cars traveling on tram-lines laid in the bottom of the trenches before mentioned, tops of cars being on a level with bottoms of the roast-heaps. Roasted ore is trammed to the burnt-ore bins, 1,500' distant and just behind the blast-furnace building,

there being eighteen 50-ton bins with central bottom-discharge gates emptying into tram-cars running over scales to the charging-floor of the furnace. The Tyee roast-yard is the best-planned, taking all things into consideration, of any roast-yard now in use by any copper reduction works.

The furnace plant, terraced throughout, to permit handling of material by gravity, has a 56x81' furnace building, of wood, with one 42x120' Allis-Chalmers water-jacket blast-furnace, rated by company at 200 tons daily capacity, but which actually smelted an average of 245 tons daily, during 1904. Hot-blast is to be added, and the building has room for a second furnace of the same size. The furnace has a water-jacket forehearth for matte, slag skimming into a settler and thence into a sluice, where granulated and washed away by running water. The dust-flue, 8x11x165', arched over with corrugated iron, leads to a 90' smokestack, of 7' diameter. The reduction plant also includes a complete sampling mill, briquetting plant for fines, electrolytic assay plant and an electric light plant. The furnace reduces 9.45 tons of charge with one ton of coke. The plant also does some custom business, and sells its product as a 50% matte to American smelters having bessemerizing works.

For the calendar year 1904, the Tyee works smelted 57,450 tons of Tyee ore, and 7,953 tons of custom ore, producing therefrom 6,025,688 tons of matte, carrying 5,120,870 lbs. fine copper, 179,769 oz. silver and 11,088.83 oz. gold. Of this production the share made from Tyee ore was 5,045,000 lbs. fine copper, 168,000 oz. silver and 9,700 oz. gold, as compared with 3,604,000 lbs. copper, 121,900 oz. silver and 6,600 oz. gold in 1903. For 1904 the average net smelter returns were 3.96% copper, 2.55 oz. silver and 0.156 oz. gold per ton.

It is indeed a pleasure to review the property and operations of so thoroughly clean and good a concern as the Tyee—a management and a mine without a flaw or blemish on either. The Tyee has by no means reached its full stature, and to predict a great future for the property, under its present wholly admirable management, is unnecessary. The plain facts are eloquent in themselves.

TZAREVO-ALEXANDROVSKI WORKS.

SIBERIA.

Office, mine and works: Semipalitinsk, Siberia. Mines are said to be rather promising, though but slightly developed, and to give an average annual production of about 500,000 lbs. of refined copper.

UBEHEBA COPPER CO.

CALIFORNIA.

Mine office: Goldfield, Inyo Co., Cal. Capitalization \$1,000,000, shares \$1 par. Lands, sundry claims, about 50 miles south of Goldfield, in the Ubeheba Mountains, said to show veins of 8' to 50' width, carrying auriferous and argentiferous ores, up to 20% in copper tenor. Lands are in Death Valley.

UDO MINE.

JAPAN.

Mine office: Usagi-mura, Mikawa-gori, Izumo, Japan. Ores are chalcopyrite and bornite, accompanied by hematite and limonite, in a vein 3' to 18' wide and 320' long. Was worked extensively, 1870-1881, but present production is trivial, vein being nearly exhausted.

UGURCHAISKA & GALIZURSKI MINES.**RUSSIA.**

Office: care of G. Chaimazidi, manager, Batum, Russia. Owned by Kunderov Bros. Mines, in the government of Elizabetopol, are small producers only.

UINTAH COPPER SUMMIT CO.**UTAH.**

Office: 25 Equitable Bldg., Boston, Mass. Mine office: Vernal, Uintah Co., Utah. Presumably idle.

ULIDA GROUP.**CALIFORNIA.**

Office: care of Wm. L. Hunter, owner, Lone Pine, Cal. Lands, 8 claims, in Inyo county, California, showing contact veins between limestone and granite, carrying auriferous and argentiferous malachite and tetrahedrite, with occasional cuprite. Has made small smelter shipments of hand-sorted high-grade ore.

UNAWEEP COPPER MINING & MILLING CO.**COLORADO.**

Office: care of James V. Howard, secretary, Grand Junction, Colo. Lands, 6 claims and a millsite, in the Unaweep district, slightly developed.

UNCLE SAM CONSOLIDATED MINING CO.**UTAH.**

Mine office: Eureka, Juab Co., Utah. Ores carry gold, silver, copper and lead. Has steam power and employed about 25 men at last accounts.

UNCLE SAM COPPER CO.**ARIZONA.**

Office: 1743 West 25th St., Los Angeles, Cal. Mine office: Gilbert, Yavapai Co., Ariz. Organized July, 1901, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Milo Baker, president; W. T. Somes, secretary, treasurer and general manager. Lands, 5 patented claims, area circa 100 acres, 12 miles from a railroad, showing several ore bodies, of which one is being developed by a 188' shaft, showing a 5' to 6' ore body giving assays of \$20 to \$40 per ton in copper, gold and silver, from oxide and sulphide ores, mainly the former, the latter being very rich in gold and silver.

MINAS UNION y CONSTANCIA.**MEXICO.**

Office and mines: Indé, Durango, Mexico. Reinaldo E. Avila, general manager. Country rock is andesite, showing 9 ore bodies carrying chalcopryrite, galena and spahlerite, associated with iron pyrites. One ore body under development averages 2 metres width and has been opened by a shaft of 18m. and tunnels of 70m. and 100m., giving first-grade ore averaging 43% lead, 100 oz. silver and 54 oz. gold, and second-grade ore averaging 4% copper and 20 oz. silver, latter showing a little native copper. Mines were opened by the Spaniards in the Sixteenth Century. Smelter, 4 miles from the mine, has two 30-ton water-jacket blast-furnaces, shipping matte to the Aguascalientes works of the American Smelting & Refining Co. for conversion and refining.

UNION COPPER LAND & MINING CO.**MICHIGAN.**

Office: 60 State St., Boston, Mass. Mine office: Calumet, Houghton Co., Mich. Organized, 1863, reincorporated, 1893, under laws of Michigan, with capitalization \$2,500,000, shares \$25 par; issued, \$2,000,000. Annual meeting, fourth Thursday in March. H. F. Fay, president; Geo. G. Endicott,

secretary and treasurer; James Chynoweth, superintendent; preceding officers, John C. Watson, Rogers L. Barstow and C. D. Coffin, directors; J. Abner Sherman, land agent; Old Colony Trust Co., of Boston, registrar. Lands, about 200 different parcels, area upwards of 7,000 acres, practically all on the mineral belt, in Keweenaw, Houghton and Ontonagon counties, Michigan. Much of the land is covered with valuable timber, including pine, hemlock and hardwood, mainly the latter. Company had a cash balance of \$79,458.24 on hand January 1, 1904. One tract of 240 acres, adjoining the Miskwabik, may be consolidated with the Miskwabik and Federal in a new mining company, during 1905.

UNION COPPER MINING CO.**CALIFORNIA.**

Mine office: Copperopolis, Calaveras Co., Cal. David Ross, superintendent. Controlling stock interest is owned by estate of Fredk. L. Ames, Boston. Lands include the Union, Keystone and Empire mines, also 2 claims adjoining the Alto in Del Norte Co., Cal. Mines were opened in 1861, and were considerable producers, paying fair dividends, circa 1861-1866. Formation is a black pyritous slate in amphibolite schists, this belt running from Toulumne county on the south, through Calaveras into Amador county on the north. The vein of pyritous slate is 3' to 40' wide, with strike of 30° east of south and a dip of 30° to the east. Ore occurs as lenses of 15' average width, connected by stringers, main lense being 2' to 40' wide and 600' long. The alteration zone, about 30' in depth, carries rich oxides and carbonates, and some native copper, below which occurs chalcopyrite carrying neither gold nor silver and unusually free from arsenic, antimony, bismuth and other undesirable elements. So pure is the ore that the blister copper therefrom makes good wirebars without electrolytic refining. Ore is classified in two grades, as smelting ore of 10% to 11% tenor, and leaching ore carrying 5% to 5.5% copper. Main shaft is 60' deep, bottomed in a 15' lense of medium-grade ore, and the mine has a mile of openings in ore. Equipment includes a good hoist, pumps, etc., with necessary mine buildings. A 100-ton Orford smelter, installed 1889, is not in blast, operations being confined to leaching the old dumps, which are extensive, with a force of about 20 men.

UNION COPPER MINING CO.**NORTH CAROLINA.**

Office: 11 Broadway, New York. Mine office: Gold Hill, Rowan Co., N. C. Employs about 50 men. Organized 1899, under laws of New Jersey, with capitalization \$3,000,000, shares \$10 par. Calvin H. Allen, president; Temple T. Berdan, secretary; John A. Traylor, superintendent.

Lands, circa 1,150 acres, about 15 miles from Salisbury, in Rowan and Cabarrus counties, North Carolina, well watered and timbered, showing 13 copper veins and one vein each of gold, silver and lead, a little work having been done on the silver and gold veins. Principal mining developments are on the "Big Cut" copper vein, with 10 shafts, the 3 main working shafts being about 500' deep each. This vein carries a little native copper and oxidized ore in the upper portion, with chalcopyrite below, and is claimed to average 10% copper, 3 to 30 oz. silver and \$1.50 to \$7.50 gold per ton. Dr. A. R. LeDoux, however, found only 4% to 5% copper, 3 to 5 oz. silver

and 40 cents to \$1.20 gold per ton, which may be accepted as a true average. Property has a concentrator and smelter, latter having roasters and two 40-ton blast-furnaces, blown in September, 1901, and blown out June, 1902, since which time the mine has shipped concentrates only.

Machinery plant is extensive, though not well planned, including 27 boilers, 18 hoists, 3 air-compressors and an electric light plant. Property has four dams, with storage capacity for 3 months' operation, and a 25,000' sawmill. Buildings include a concentrator, smelter, 45x75' machine shop, 40x60' smithy, iron and brass foundry, sundry engine and boiler-houses, a stable for 400 horses and mules, office building, 52-room hotel and about 130 dwellings. Company's affairs were badly muddled before present management secured control.

UNION COPPER MINING CO.

WYOMING.

Office and mine: Encampment, Carbon Co., Wyo. Organized under laws of Wyoming, with capitalization \$1,000,000, shares \$1 par. Henry C. Hedges, president; A. E. Mosier, secretary. Lands, 100 acres, 3 miles from Encampment, slightly developed. Has steam power. Officers stand well and property is considered promising.

UNION COPPER SMELTING CO.

A fraud, promoted by the notorious Wernse gang, of St. Louis.

UNION DEVELOPMENT CO.

CALIFORNIA.

Property is the Juanita claim, in the Morrow district, 26 miles east of Johannesburg, San Bernardino Co., Cal., showing a contact vein, between granite and limestone, carrying auriferous chalcopyrite, with talcose gangue, opened by 4 shafts, deepest 212'.

UNION ORE EXTRACTION & REDUCTION CO.

COLORADO.

Office: 828 Equitable Bldg., Denver, Colo. Works office: 31st & Wewatta Sts., Denver, Colo. F. B. Spalding, president; Peter W. McCaffrey, vice-president and general manager; Wm. J. Smith, secretary. Has a plant using the Gardiner copper leaching and precipitating process, with daily milling capacity of 300 tons, and leaching and precipitating capacity of 75 tons.

UNITED ALKALI CO., LTD.

SPAIN.

Offices: St. Helens, England. Mine office: Huelva, Spain. Wm. Guthrie Bowie, mine manager. Capitalization, £8,750,000. Has paid 19% on common stock, since 1890. Company is a chemical and manufacturing corporation, with which copper mining is merely a small branch of the general business, and controls 46 subsidiary works and companies, some of great size. Has large works at St. Helens, Runcorn, Flint, Widnes and Glasgow, making extensive use of Spanish and Portuguese pyrites, which are burned for sulphur, the cinder of the cupriferous pyrites being leached for copper. The principal copper holdings of the company include the Monte Rubio group, held under lease from C. & J. Sundheim, this including the Monte Rubio, Gibraltar and Atbalcal Arbalcal mines, having a combined area of about 100 hectares, at Paimogo, Huelva, Spain. These are ancient properties, worked only to the level of the nearest stream in the Roman era, these old workings,

though comparatively superficial, disclosing enormous masses of ore, occurring as oxides, carbonates, sulphides and sulphate, with iron ore gangue, indicating the existence of large bodies of unaltered iron-copper sulphides at greater depth. The company also leases El Tinto and La Santa Rosa mines, with adjoining properties, area 141 hectares, at Zalamea la Real, Huelva, Spain, from the Sociedad de las Minas de Cobre Tinto y Santa Rosa. Company also has sundry undeveloped mineral leases on the river Guadiana, and plans building a 22-kilometre railway from Monte Rubio to Coíña Veral, on that river, and constructing wharves at the latter point for shipping ore to Great Britain. A 9-kilometre Bleichert aerial tram connects the mines with the railway at Calañas.

UNITED ARIZONA COPPER CO., LTD.**ARIZONA.**

Offices: 38, Broad Street Ave., London, E. C., Eng. Rt. Hon. Earl of Orford, chairman; W. P. Guthridge, mine manager; J. F. Shearer, secretary. Organized Oct. 15, 1902, with capitalization £200,000, shares £1 par; issued, £160,000. Lands, 500 acres, in Pinal county, Arizona, said to have been bought for £160,000 cash, carrying auriferous and argentiferous copper ores. Main shaft is 600', said to develop considerable ore bodies. Equipment includes a 30-ton smelter, and erection of a 100-ton smelter and leaching plant is contemplated. Ore smelted in the past is said to have averaged 9% copper, with considerable gold and silver values. It is rather remarkable that such an important property seems to have escaped all notice in Arizona. If it were not that a belted earl is chairman, the uncredulous might be inclined to ask for a bill of particulars regarding the property.

UNITED BINGHAM GOLD & COPPER MINING CO.**UTAH.**

Office: Salt Lake City, Utah. Mine office: Bingham Canyon, Salt Lake Co., Utah. Louis Moore, president; A. Hanauer, Jr., secretary; Harry Joseph, superintendent. Lands, several claims, patented, partly developed by the Snowstorm tunnel, which has opened a 4' vein assaying 2% copper, 25% lead and up to \$8 gold per ton.

UNITED BUFA MINES.**MEXICO.**

Office: 1 Exchange place, Jersey City, N. J. Organized 1903, under laws of New Jersey, with capitalization \$300,000, shares \$1 par, to mine copper and other ores in Mexico. No trace found of operations.

UNITED COPPER CO.**ARIZONA.**

Address unknown. Organized under laws of Arizona, with capitalization \$50,000. Chas. M. Moore, secretary; Andrew A. Myers, treasurer.

UNITED COPPER CO.**MONTANA.**

Offices: 31 Nassau St., New York and 26 Equitable Bldg., Boston, Mass. Mine office: Butte, Silver Bow Co., Mont. Employs 1,500 men, though subsidiary mining companies. Organized Apr. 28, 1902, under laws of New Jersey, with capitalization \$80,000,000, in \$5,000,000 of 3% preferred stock and \$75,000,000 common stock, par \$100, of which all the preferred, and \$45,000,000 of common have been issued. F. August Heinze, president; Arthur P. Heinze, first vice-president; John MacGinnis, second vice-president; Stanley Gifford, secretary and treasurer; F. A. Hienze, John MacGinnis,

Stephen E. Nash, A. A. Brownlee, Hugo Blumenthal, A. P. Heinze, Jacob Langeloth, Frederick W. Whittridge and G. Reusens, directors; Hallgarten & Co., of New York, transfer agents; Metropolitan Trust Co., of New York, registrar. Common stock is listed on the Boston exchange.

It has been asserted in the public prints, apparently with authority, that Mr. F. August Heinze was not president of the company, in December, 1904, but if such was the case, the fact is of small importance, because Mr. F. A. Heinze is absolute master of the United Copper Co., and his holding or resigning any office connected with the company may be set down as a minor detail, caused by the fortunes of war, in the litigation now in progress with the Amalgamated Copper Co.

The United Copper Co. is a securities holding corporation solely, organized on the same general lines as its great rival, the Amalgamated Copper Co. F. August Heinze and his associates in the Montana Ore Purchasing Co. are credited with holding considerably more than a controlling interest of the stock issue. The United Copper Co. began business as the owner of 76,791 shares of stock of the Montana Ore Purchasing Co., 123,500 shares of Nipper Consolidated Copper Co., 950,000 shares of the Belmont Mining Co., 1,800,000 shares of Cora-Rock Island Mining Co., and 2,950,000 shares of Minnie Healy Mining Co., this being 95% of the stock issue of each company named, and is stated to have begun its corporate existence with a cash surplus of \$600,000. The United Copper Co. also owns the entire issue of \$1,000,000 first-mortgage bonds of the Montana Ore Purchasing Co. and the entire issue of \$2,500,000, first-mortgage bonds of the Nipper Consolidated Copper Co. The principal value of these holdings lies in the stock of the Montana Ore Purchasing Co., which, with its various subsidiary corporations, is engaged in extensive litigation with the Amalgamated Copper Co., there being nearly 100 separate actions at law between these corporations, with no seeming possibility that the litigation ever will be ended, except by the collapse of one of the companies, or by mutual agreement outside of the courts. The Johnstown and Rarus mines of the Montana Ore Purchasing Co. adjoin the Pennsylvania mine of the Boston & Montana Co., controlled by the Amalgamated, and the titles and affairs of all these companies are involved in a hopeless fog of litigation.

Production of refined copper by the subsidiary companies of the United Copper Co. was about 28,500,000 lbs. in 1903, and for the year ending June 1, 1903, profits of the various subsidiary corporations were \$601,250, and for the year ending June 1, 1904, aggregated \$519,226. Dividends paid in 1903 were \$450,000. Productive capacity of the various mines controlled by this company is about 3,000,000 lbs. per month, when working full forces, and output for calendar year 1904 was 35,311,853 lbs. fine copper.

The Heinze properties at Butte, controlled by the United Copper Co. are large and valuable. Unfortunately titles are so mixed that shareholders lack certainty regarding their investments. The fight in Montana is of such an unscrupulous nature, and so utterly divested of the characteristics of modern humanitarian warfare, that neither the Amalgamated nor

United companies hesitates to use any means at command to best the opposing party. Both interests include some men of very high personal standing—men whose personal words would be accepted as readily as their bonds—yet the evidence at command shows that both parties are not at all scrupulous in fighting each other. The excuse of both is the same—the old excuse of fighting the devil with fire. It is a strange, yet suggestive fact, that the men engaged in this internecine warfare in Montana are personally men of deservedly high standing, whose word would be accepted without question by any acquaintance, yet, in business matters, and especially in the litigation before the Montana courts, neither side seems greatly troubled by twinges of conscience.

UNITED COPPER MINING CO.**ARIZONA.**

Is a twin of the Providencia Gold, Silver & Copper Mining Co., and apparently claims same ground as claimed by the Lincoln Consolidated Mining Co., and by several other Lincoln companies.

UNITED COPPER-GOLD MINING & EXTRACTION CO.**ARIZONA.**

Still-born. Intended lands now held by Eagle Copper-Gold Mining & Milling Co.

UNITED EMPIRE CO.**BRITISH COLUMBIA.**

Office: Bridgeport, Conn. Mine office: Princeton, B. C. Organized 1904, with capitalization \$500,000, shares \$1 par. Dr. R. A. Lockhart, president; W. C. McDougall, vice-president; Edwin L. Foster, secretary-treasurer. Development is by numerous opencuts across the strike of the main vein for a distance of about 3,000', showing a vein averaging about 50' in width. Surface ores are azurite and malachite. Property also has a 125' tunnel, and carries a large bed of limestone for fluxing. Company plans extensive developments during 1905.

UNITED EXPLORATION CO.**WYOMING.**

Office: 113 Devonshire St., Boston, Mass. Supposed to have absorbed the Beulah Copper Co., of Wyoming.

UNITED GERMAN COPPER MINES, LTD.**GERMANY.**

Letter returned unclaimed from former office in London. Lands of company were claimed to be at Münster-am-Stein, Bavaria, Germany.

UNITED GLOBE MINES.**ARIZONA.**

Office: 99 John St., New York. Mine office: Globe, Gila Co., Ariz. Jas. Douglas, president; Geo. Notman, secretary and treasurer; Niles S. Berray, superintendent. Capitalization said to have been increased, in 1903, from \$1,300,000 to \$2,300,000. Lands, 20 patented and 9 unpatented claims, lying next west of the Old Dominion group, also 3 millsites, in the Globe district. Mine is extensively developed and very wet, having a 765' three-compartment main shaft, showing an ore chute 30' wide and 700' long on the 7th level, averaging 4% and upwards in copper. Ore bodies are extensive but erratic, and ore is highly silicious, requiring heavy fluxing. Leasers have shipped ores averaging 20% copper and 1 oz. to 15 oz. silver per ton, but the high-grade ore made by the company averages about 14% copper. Mine has a 200-ton smelter and made 830,000 lbs. of refined copper in 1901, and largest

production was 4,451,180 lbs. in 1899. Property is operated under a close working agreement with the Old Dominion mine, details of this arrangement being given in the description of the Old Dominion Company.

UNITED GOLD & COPPER CO. NEW MEXICO & CALIFORNIA.

Office: 801-159 La Salle, St. Chicago, Ill. Branch offices: New York, Columbus, Ohio and Santa Fé, N. M. Mine office: Lordsburg, Grant Co., N. M. Organized 1902, under laws of New Mexico, capitalization \$5,000,000, shares \$1 par. R. M. Wilbur, president; W. F. Weyburn, secretary; Wilson I. Davenney, assistant secretary; D. A. Walker, treasurer; A. M. Wilson, mine superintendent. Lands are in New Mexico and California. New Mexico holdings are 4 groups, area 400 acres. The first group, about 5 miles from Santa Fé, shows auriferous and argentiferous oxide and carbonate ores of copper. The second New Mexican group of 7 claims, area 140 acres, is in the Gallinas district of Lincoln county, showing a dike ranging 10' to 100' in width carrying copper, gold and silver. The third New Mexican group is 4 claims, area 120 acres, in the San Andreas district of Socorro county, showing two large fissure veins giving good assay values in copper, lead, silver and gold. The fourth group of 5 claims, area 100 acres, is in the Shakespeare or Virginia district of Grant county, and is being developed. Company also is opening gold mines in the Cherokee district, about 10 miles from Oroville, Butte county, California, on 8 claims, area 100 acres, carrying gold placers and a quartz lode, latter having an 800' tunnel and about 1,700' of underground openings. California property is well spoken of, but company has been paying quarterly dividends of 1% and selling stock simultaneously, hence is regarded with much suspicion.

UNITED GOLD & COPPER MINING CO. COLORADO & NEW MEXICO

Office: 32 Broadway, New York. Mine office: Turret, Chaffee Co., Colo. Capitalization \$1,500,000, shares \$1 par. Lands, sundry claims in the Turret district of Colorado and claims near the Santa Rita mines in New Mexico. Is regarded with suspicion.

UNITED METALS SELLING CO.

Office: 42 Broadway, New York. Organized 1899, under laws of New Jersey, with capitalization \$5,000,000, shares \$100 par. Dividends were 10% annually in 1902, 1903 and 1904, but earnings are supposed to have been considerably larger. Adolph Lewisohn, president; Urban H. Broughton, treasurer and general manager; Allan N. Evarts, secretary; H. H. Rogers, Wm. Rockefeller, Adolph Lewisohn, Jesse Lewisohn and C. P. Olcott, directors. The company does a general brokerage business in metals, the great bulk of its trade being in copper, of which it is much the largest sales-agent in the world, selling about 600,000,000 lbs. of copper yearly. Is closely affiliated with the Amalgamated Copper Co.

UNITED MEXICAN MINING & SMELTING CO.

Stock in this corporation is being peddled by the notorious "Rev." C. E. Nylin, of the Laborers Co-operative Gold, Silver and Copper Mining Co. Anything that this larcenous minister of the gospel is connected with may be set down safely as a swindle of some sort.

UNITED MINES CO.**ARIZONA.**

Office: Globe, Gila Co., Ariz. Organized 1904, with capitalization \$5,000,000.

UNITED MINING & DEVELOPMENT COMPANY OF AMERICA. CALIFORNIA & MEXICO.

Office: 66 Broadway, New York. Capitalization \$10,000,000, shares \$10 par, in \$2,000,000 of 6% preferred and \$8,000,000 of common stock. John Thomson, president; John R. Stanton and Albert F. Freeman, vice-presidents; Alfred W. Kiddle, secretary; E. F. Phelps, treasurer; Albert F. Freeman, general manager. Is a promotion and development company, formed to open and finance mines along much the same lines as the Venture Corporation of London. Holdings include 40 acres, known as the King Solomon mine, at Valley, Calaveras county, California, and the Nevada de las Miches mine, of 107 pertenencias, area 264 acres, in the Fuerte district of Sinaloa, Mexico. The California property has about 2,000' of underground openings, giving assays of \$12 to \$15 per ton, in gold and copper. A little development also has been secured on the Sinaloa property.

UNITED RICO MINES CO.**COLORADO.**

Mine office: Rico, Dolores Co., Colo. Percy S. Rider, superintendent. Ores carry gold, silver, copper and lead. Has steam and electric power, mill with 20 stamps and 3 Huntington mills, and 100-ton smelter, employing about 50 men at last accounts.

UNITED SPANISH COPPER MINES, LTD.**SPAIN.**

Voluntarily wound up, February, 1901.

UNITED STATES GOLD INCORPORATION.**COLORADO.**

Mine office: Eldora, Colo. John F. Rowell, general manager. Lands, 300 acres. Said to plan developing claims in the Arapahoe copper-gold belt by tunnel.

UNITED STATES & GUERRERO EXPLORATION CO.**MEXICO.**

Office: Ashland, Ky. Capitalization \$1,000,000. Dr. J. Letton Martin, president. Lands, 148 acres, in the states of Michoacán and Guerrero, Mexico, former holdings being not far from the Inguarán.

UNITED STATES & MEXICAN MINING CO.**MEXICO.**

Office: 42 Murray St., New York. Mine office: Hostotipaquillo, Jalisco, Mex. Isaac P. Martin, manager. Lands include the Trinidad and Guadalupe mines, carrying gold, silver, lead and copper ores. Has water power and is claimed to employ about 100 men.

UNITED STATES MINING CO.**UTAH.**

Office: 50 Congress St., Boston, Mass. General Utah office: 508 Dooly Bldg., Salt Lake City, Utah. Mine offices: Bingham Canyon, Salt Lake Co., Utah, and Tintic, Juab Co., Utah. Works office: West Jordan, Salt Lake Co., Utah. Organized 1899, and reorganized 1901, with capitalization \$21,500,000, shares \$25 par, of which 472,637 shares are issued, 60,000 shares having been issued, 1904, to secure control of the Mammoth mine, in California, through purchase of controlling stock interest in the Mammoth Copper Mining Co. Company has an authorized bond issue of \$600,000, of which

only \$75,000 of first-mortgage bonds are outstanding. A 50-cent dividend, aggregating \$206,318, was paid July, 1904, and a 50-cent dividend was paid February, 1905. Company controls, through stock ownership, the Centennial-Eureka Mining Co. and the United States Smelting Co., and also holds a majority stock interest in the Mammoth Copper Mining Co. Robert D. Evans, president; Wm. H. Coolidge, vice-president; Albert F. Holden, managing director; F. W. Batchelder, secretary and treasurer; Walter Fitch, general manager; C. E. Allen, mine superintendent; A. P. Maybury, superintendent Bingham mines; R. A. Brown, superintendent Tintic mines; S. C. Hazelton, smelter superintendent; T. R. Jones, manager custom ore department; Richard A. Parker, consulting engineer; Percy Williams, engineer; H. C. Bellinger, consulting metallurgist; Aron Hirsch & Sohn, sales agents, represented in the United States by L. Vogelstein, of New York.

The mines of the company are in two groups, one at Bingham and one at Tintic. The properties at Bingham, which were the original holdings of the company, include the Telegraph, Old Jordan, Niagara, Commercial and adjoining claims. The Niagara, which apparently is of the least importance, is held through a stock interest, and minority stockholders have fomented more or less litigation, which was settled favorably to the United States company, November, 1904. The California property is separately described under the title of Mammoth Copper Co. The Telegraph and Old Jordan were originally silver mines, opened on a fissure vein of silver-lead ore crossing the big sulphide copper dyke from which the present production is secured. The copper ores are silicious and deficient in iron, requiring heavy fluxing. The Bingham ores range in tenor from 1.5% to 2% copper, with 2 to 5 oz. silver and \$1 to \$2.50 gold per ton. The Old Jordan and Telegraph ores are said to be giving smelter returns of 26 to 28 lbs. copper and \$2 to \$2.50 gold and silver per ton. The deepest workings at Bingham are about 400' only, with about 5 miles of openings on the Old Jordan group, developing a large amount of ore. The Galena mine, now being reopened, is developed to a depth of 235' and produced upwards of \$1,000,000 under previous ownership, the record showing average smelter returns of 20% lead, 25 oz. silver and up to \$10 gold per ton. The aerial tramway, taking the ore from mines to railway, has a capacity of 25 tons per hour.

The Tintic group includes the Centennial-Eureka and Tintic mines, control of the Centennial-Eureka, which has been a large dividend-payer in the past, being held through ownership of all but about 100 shares of the capital stock. The Tintic properties are old mines, producing ore of two grades, the oxides and carbonates carrying high values in gold and silver and ranging from \$10 to \$30 per ton in value. The low-grade deposits are of enormous extent but carry only small gold and silver values. The main shaft, 1,500' deep, was thoroughly retimbered and stoping begun in September, 1902. The Centennial-Eureka was examined early in 1905, by J. Parke Channing, a conservative and fully competent authority, who found reserves of 600,000 tons of ore carrying average values of \$11.88 per ton. The various mines of the United States company have about 2,000,000 tons of ore blocked

out for stoping, of which about 90% is low-grade, this being sufficient for about 5 years' requirements. The mines are well equipped with hoisting and other machinery.

The smelter, on a 150-acre tract near the works of the Utah Consolidated and Bingham companies, is 12 miles from Bingham and 80 miles from Tintic. The plant has a present daily capacity of 1,200 tons of copper ore and 300 tons of lead ore, with 7 blast furnaces for copper and 3 for lead ores, furnaces ranging from 100 to 200 tons daily capacity each. There also is a 125-ton reverberatory furnace. Formerly pyritic smelting of raw ore was employed in the copper stacks, but the system of smelting has been changed somewhat, especially in the mixing of charges. The company has bought an iron mine and will use iron ore for fluxing the silicious Bingham ores. While the use of barren flux will decrease the capacity of the works in net copper production, it should increase the net profits of operation. In the lead smelter there are 10 hand roasters, and 2 stacks are kept in blast, the third being held in reserve. The bessemerizing department in the copper smelter has 2 stands of converters, with electric traveling cranes, and the works also have a briquetting plant for fines and flue-dust, silica-mill, and electric light plant.

Production in 1904 was about 12,000,000 lbs. fine copper. Walter Fitch, the new general manager, is a strong man, with a 20-year record of highly successful mine management, under considerable difficulties, in the Lake Superior district, and under his control the affairs of the United States are showing a decided improvement. The property is extensive and valuable, and Mr. Fitch may be relied on to make it highly profitable as well.

UNITED STATES MINING & SMELTING CO.

MEXICO.

Office: 88-6 Wall St., New York. Capitalization \$5,000,000. Joseph Gray Kitchell, president; Henry Voorce Brandenburg, treasurer; Thos. B. Johnson, superintendent. Said to own the San José de Gracia, sometimes called the Ajogada mine, 45 miles from Hermosillo, Sonora, Mexico, area 5 pertenencias, or a trifle more than 12 acres, said to have been worked by the ancients, but idle and filled with water for about a century.

UNITED STATES REDUCTION & REFINING CO.

COLORADO.

Office: 54 Wall St., New York. Works office: Colorado Springs, El Paso Co., Colo. Chas. L. Tutt, president; Chas. N. MacNeill, first vice-president and manager; Spencer Penrose, secretary and treasurer. Organized May 31, 1901, under laws of New Jersey, with capitalization \$10,000,000, in \$4,000,000 non-cumulative 6% preferred and \$6,000,000 common stock, paying 1½% quarterly dividends in 1902 and 1903 on preferred stock, and 1% quarterly dividends on common stock. Has extensive refining plants at Colorado City, Florence and Canyon City, Colorado.

UNITED VERDE COPPER CO.

ARIZONA.

Office: 49 Wall St., New York. Mine office: Jerome, Yavapai Co., Ariz. Employs about 1,000 men. Organized Sept. 11, 1899, under laws of West Virginia, with capitalization \$3,000,000, shares \$10 par; issued, \$2,999,270. Present company succeeded old corporation of same title, organized under laws of New York. Debentures, \$3,000,000 authorized; \$2,998,800 issued,

payable 1949. Annual meeting, third Monday in February. Paid seven 75-cent dividends, amounting to \$1,557,000, in 1904. Is conducted as a close corporation, Senator Clark being supposed to own about 90% of the capital stock. Wm. A. Clark, president; Jas. A. MacDonald, vice-president; Chas. W. Clark, general manager; preceding officers, Henry G. Atwater and Jas. Kitchen, directors; J. C. Kennedy, secretary and treasurer; W. L. Clark, assistant superintendent; Robt. Mitchell, smelter superintendent; Otto Strodhoff, chief clerk; Geo. Bosch, master mechanic.

Lands, 13 claims, area 230 acres, with sundry adjoining lands, in the Verde district of the Black Hills range, at an elevation of 5,600' above sea-level and 1,800' above the valley of the Verde river. The United Verde was a small gold and silver mine, until bought by Senator Clark, in 1888. The mine is in a zone of slates and intrusive dioritic rocks, the neighboring limestone being unconformably superimposed, and apparently having no connection with the ore deposits. The mine is opened on a single monstrous lense of sulphide ore, in slate, the lense having a dip of 72°, and being intruded by a quartzite dyke 70' wide carrying about 1% copper and 1 to 13 oz. gold per ton, ore from which is used for converter linings. The gossan outcrop, carrying auriferous and argentiferous oxide and carbonate ores to a depth of about 160', has been worked out. The zone of secondary enrichment carries mainly chalcocite, with some covellite and other alteration minerals of copper, all highly argentiferous. The unaltered ores, mainly chalcopyrite, with a little bornite, are both auriferous and argentiferous. In mining no assortment is made and no concentration attempted, everything from the mine openings going to the furnaces, the average of the ore taken from the openings being about 7% copper. The ore is very rich in sulphur and much heat is generated in the stopes, spontaneous combustion being frequent. Access to the mine is secured with extreme difficulty and only upon a written order from Senator Clark, such orders being very uncommon, and employees are cautioned against giving out information. Underground openings are very extensive, with enormous ore reserves, estimates of ore in sight varying greatly, and ranging up to 20,000,000 tons, containing about 1,500,000 tons of pure copper, which is an overestimate. This ore is developed above the 800' level, diamond drill borings showing ore to a depth of 2,000'. It is not known that the ore is leaner at that depth, but in all likelihood there is a material decrease in all metallic values at depth. The lense is at least 1,900' long and has an extreme width of 600'. The mine is worked pillar-and-stall, and timber, when used, is placed as square sets. Worked-out stopes are filled with barren rock, blasted from the mountain side above the mine, and milled into the abandoned stopes, a practice regarded as dangerous. The deepest shaft of the mine is but 800', but is to be deepened. Much trouble has been experienced in the past from the drawing of shafts. The 6x18' main working shaft is equipped with 2 double-deck cages and has a 700-h. p. hoist, capable of raising 3-ton loads from a depth of 2,000'. A new 5-compartment shaft, 900' from the main working shaft, was planned to be sunk entirely in the wall, but cut ore at a depth of 600' and has held same con-

tinuously to present depth of 800'. This shaft has 4 cages, worked in counterbalance, and is to become the main working shaft of the mine. Electric traction is used underground for haulage.

Owing to its richness in sulphur the ore is liable to spontaneous combustion and a sharp watch is kept for fires, which are extinguished at their inception, when possible, or otherwise walled in by solid masonry bulkheads. Owing to the more or less shattered condition of the lense it is difficult to entirely prevent access of air, very little of which will keep a fire burning indefinitely in an ore so rich in sulphur as that of the United Verde. The most serious outbreak of fire was in August, 1902, causing a total suspension of mining. The fire was finally gotten under control by pumping the mine full of carbonic acid gas, this being made by treating crushed limestone with dilute sulphuric acid in iron tanks, gas being forced by natural pressure into the top of the shaft, whence it fell by gravity to the bottom of the mine, displacing the lighter atmospheric air. The fire on the 400' level has been burning since 1897, and although its progress is cut off as much as possible by bulkheads, is eating its way slowly but steadily to the 700' level, at the bottom of the mine. Fire, however, while dangerous and annoying, cannot burn up the copper, all of which will be recovered eventually. The mine is subject to bad caves, one of which carried down the office building and killed a number of employes several years ago. From a miner's standpoint the United Verde is not an especially desirable working place, as the openings are very hot and the acid waters cause blisters and sores upon the unprotected skin, while the mine fires and caving ground render underground work more or less dangerous. Efforts have been made to render the mine safer, but, owing to its having been opened wrongly at the start, these are not entirely successful.

All ore above 12% in copper tenor is sent direct to the smelter, the balance being trammed through a 1,300' tunnel on the 500' level to the roast-yard, where the ore is heap-roasted with cordwood, on contract, each 500-ton heap requiring an average of 5 to 9 weeks for roasting. After roasted the ore is trammed back into the mine through the tunnel and hoisted through the shafts to the smelter, the exceedingly precipitous nature of the ground rendering it impracticable to secure direct connection between the smelter and roast-yard, except through the mine. The smelter and the town of Jerome, which has grown up around the mine, are in a narrow gorge, the smelter standing squarely on top of the mine. Much trouble has been experienced from the settling of the mine, which more than once has injured the buildings and machinery.

The smelter was largely rebuilt during 1903, this work having been accomplished under difficulties while the smelter was in blast. The plant formerly had six 160-ton water-jacket blast-furnaces, one reverberatory furnace for smelting flue-dust and ores especially rich in gold and silver, and a tilting furnace for casting anodes. The smelter now has two 500-ton furnaces and one 250-ton furnace in blast, with a third 500-ton furnace in place, giving a daily capacity of 1,750 tons. The plant has 6 stands of

converters, with 15 shells, also two 50-ton electric traveling cranes and powerful blowing machinery. Electric power and light are furnished by a 350-h. p. engine and dynamo. The smelter stack has a screen top to catch flue-dust. Anodes are shipped mainly to the Waelark Wire Works, at Elizabeth, N. J., for drawing into wire. Water from the mine is leached through tanks near the smelter, the copper carried in solution being precipitated on scrap-iron. Water is received through pipes by gravity, but the supply is somewhat scanty and water is husbanded carefully. Petroleum is used extensively for fuel, and a 178,000-gallon storage tank has been built for crude oil. Wood for the roast-heaps costs \$8 per cord, and even at that price is of rather inferior grade. Coke for the smelter costs \$12 to \$15 per ton and the supply is very uncertain, owing to strikes and other troubles.

The mine and smelter, at Jerome, are united with the outside world by the United Verde & Pacific railroad, a 28-mile narrow-gauge line connecting with the Santa Fé, Phoenix & Prescott railroad at Jerome Junction, this line traversing very difficult country. Underground employees work 8-hour shifts, and such as wish it are furnished rooms at \$5 per month and table board at \$7 per week, in a fine hotel built by Senator Clark.

Production of refined copper was 19,407,080 lbs. in 1902 and about 29,500,000 lbs. in 1904. The maximum product was 43,995,932 lbs. in 1899. Dividend payments were begun in 1892, on the basis of 25c. per share monthly, increased to 50c. per share per month in 1896, and again increased, in 1898, to \$1 monthly. Largest net earnings were \$5,435,970 in 1900 and largest dividends were \$4,498,680 in the same year. The cost of copper made by the United Verde, deducting the considerable gold and silver values contained, is 3c. to 5c. per pound, when working normally, but reaches 6c. to 7c. per pound when the property is operating under check owing to unfavorable circumstances. The richness and value of the United Verde usually are much exaggerated in descriptions of the property, but this is unnecessary, as the mine, without question, is one of the richest and largest ever opened. It is a question, however, whether the property has not seen its largest profits in the past, owing to the mistaken manner of its development. The circumstances under which the ore is mined at present are discouraging, and the best class of miners cannot be retained as a rule.

UNITED VERDE EXTENSION MINING CO.

ARIZONA.

Mine office: Providence, Yavapai Co., Ariz. B. L. Jones, superintendent. Organized 1894, under laws of Arizona, with capitalization \$3,000,000, shares \$10 par. First mining venture, at Jerome, proved disastrous, and promoter committed suicide. Company later took the Red Rock mine, near Providence, which is idle and for sale.

UNITED VERDE JUNIOR COPPER CO.

ARIZONA.

Office: 60 State St., Boston, Mass. Capitalization \$2,000,000, shares \$10 par. Benj. F. Peach, president and Edwin Wallace, secretary and treasurer, at last accounts. Lands, at Jerome, Yavapai county, Arizona, are slightly developed. Company is regarded with suspicion.

UNITED VERDE JUNIOR COPPER MINING CO.

ARIZONA.

Mine office: Prescott, Yavapai Co., Ariz. J. W. Deane, agent.

UNITY COPPER & GOLD MINING CO.

NEW MEXICO.

Mine office: Tres Piedras, Taos Co., N. M. Lands, 12 claims, in the Bromide district, said to have considerable development and to give a fair showing of auriferous chalcopryite, bornite and tetrahedrite.

UNIVERSAL COPPER MINING CORPORATION, LTD.

MEXICO.

Offices: 31, Lombard St., London, E. C., Eng. F Richards, secretary. Organized Dec. 21, 1896, with capitalization £40,000, shares £1 par; issued, £9,476. Company said to own interests in Mexico, but location of same, if any, not learned.

SOCIEDAD MINERA UPOLONGOS.

ARGENTINA.

Mine office: Chilecito, Rioja, Argentina. W. A. Treloar, manager. This property, in the Mexicana district, is one of the oldest copper mines in Argentina, having been operated for many years. Ores give average smelter returns of 15.3% copper, 65 oz. silver and 1.2 oz. gold per long ton. Property has steam power and owns the Progreso smelter, where ore is reduced to a 65% matte and shipped to Europe. Employed about 150 men at last accounts.

UREA MINING CO.

MEXICO.

Letter returned from former mine office, Velardeña, Durango, Mex. **UTAH APEX MINING CO.**

UTAH.

Office: care of Devens, Lyman & Co., Boston, Mass. Mine office: Bingham Canyon, Salt Lake Co., Utah. Employs about 70 men. Organized under laws of Maine, with capitalization \$2,500,000, shares \$5 par. E. R. Hastings, president; J. W. Hane, treasurer; Count Reginald Ward, British agent, 65, London Wall, London, E. C., Eng.; Walter C. Orem, general manager. Property was originally the New York and Copperfield groups, to which the Dana, Petro, and Highland Boy Consolidated groups were added, giving a total of 21 claims, area about 160 acres, advantageously located in Carr Fork, Bingham or West Mountain district and adjoining the Highland Boy and Yampa mines. The various properties contained in the consolidation have produced about 300,000 tons of chalcopryite, galena and lead carbonate ores in the past. Development is by 3 tunnels, with about 3 miles of underground openings. A tunnel now driving will tap the ore bodies 800' below the present workings, at a distance of about 3,000', and will provide drainage as well as an operating tunnel. Ores are among the richest of the district in gold and silver, and carry an excess of iron over silica, rendering them practically self-fluxing. The average of 61 assays in 1904 gave 6.2% copper, 11 oz. silver and \$8.97 gold per ton. The mines are said to have reserves of about 250,000 tons of \$10 copper ore, and about 40,000 tons of \$15 lead ore, and at close of 1904 were shipping to the United States smelter about 25 tons daily of ore netting about \$13 per ton. The mines are being opened on a considerable scale, and this property promises to become, in time, one of the large producers of the Bingham camp.

UTAH & BOSTON COPPER CO.

UTAH.

Dead. Property sold to pay debts.

UTAH CONSOLIDATED MINING CO.

UTAH.

Office: 52 Broadway, New York. Mine office: Bingham Canyon, Salt

Lake Co., Utah. Works office: Murray, Salt Lake Co., Utah. Present company is a reorganization, 1903, under laws of New Jersey, with capitalization \$1,500,000, shares \$5 par, of the Utah Consolidated Gold Mines, Ltd., a British corporation that in turn succeeded the Sevier Gold Mines, Ltd., in October, 1896. Property of the Utah Consolidated Mining Co. is 2,490 shares of the 2,500 shares of capital stock of the Highland Boy Gold Mining Co., of New Jersey, latter corporation holding direct title to the Utah properties. Reorganization was effected in the United States to save heavy British taxes, and sundry emoluments to directors, latter compounded by cash payments. About 20% only of the capital stock is held in Great Britain. Dividends of the present company and its predecessor were \$732,000 in 1901, nothing in 1902, \$960,000 in 1903 and \$600,000 in 1904. Urban H. Broughton, president; R. H. Channing, general manager; W. R. Smith, general superintendent; W. M. Johnson, superintendent; N. B. Roscorla, mine superintendent; C. L. Morris, smelter superintendent; Geo. K. Fischer, consulting metallurgist; S. S. Sörenson, mechanical engineer.

Lands are the Highland Boy group, area 239 acres, in Carr Fork Gulch, Bingham division of the West Mountain district, about $2\frac{1}{2}$ miles from Bingham Canyon. The ores are sulphides, occurring in chutes running 2% to 13% copper, with average values of \$2.50 to \$3 gold and silver per ton, the average ores carrying about 30% each of iron, silica, and sulphur, rendering them self-fluxing. There are three main ore chutes developed, largest being approximately 200x350' in area, and of unknown depth, with strong indications of additional chutes. The Highland Boy is opened by one shaft of 900' and 6 tunnels, lowest 700' below the crest of the mountain, extraction being through tunnels. The chutes apparently are somewhat smaller in the bottom levels, but carry good values and are likely to continue workable to great depth. Ore reserves probably are not less than 1,500,000 tons, of which perhaps 300,000 tons are low-grade oxidized ores. The mine also is said to have accumulated considerable reserves of high-grade ore, of which very little is smelted, for reasons best known to the management. Owing to extraction by tunnel the mining plant is not extensive, and electric power is used freely. Ore is taken from mine to railway by a 12,700' aerial tram. The new Highland Boy concentrator, rated at 500 tons daily capacity, has 18 Frue vanners, 36 Wilfley tables and 2 Wilfley slimers.

The smelter, at Murray, 10 miles south of Salt Lake City and 17 miles north of the mine, has been enlarged to about 800 tons daily capacity. The enlarged works have 20 McDougal calciners, 3 Wetley calcining furnaces and 9 reverberatory furnaces, two of the latter being 17'x43' 6". Power is furnished by a 450-h. p. Nordberg tandem compound steam engine and a 250-kw. Westinghouse electric generator. A dust-chamber, 27x56x18', has steel hopper bottoms, and the converter plant has a 190' stack 5' 6" in diameter. The ores give clean slags, the plant giving excellent results in operation, turning out 99% blister copper. Smelting costs are exceptionally low.

Production in 1902 was 11,840,431 lbs. of refined copper, 160,915 oz. silver and 19,078 oz. gold, from 168,713 tons of ore smelted, giving average

returns of about 3.5% copper and \$2.75 gold and silver per ton. Production in 1904 was 13,553,493 lbs. fine copper, and should reach about 16,000,000 to 18,000,000 lbs. in 1905. For 1903 the net profits were \$1,038,636, amounting to 47.5% of the gross earnings, operating costs being \$6.10 per ton, with gross returns of \$11.56 per ton. For 1904 the percentage of copper was somewhat lower than in the previous years, the ores treated giving average smelter returns of about 3.5% copper, 1 oz. silver and \$2.20 gold per ton. A dividend of \$1.50 per share, payable Jan. 16, 1905, was declared December, 1904. The Utah Consolidated is making copper at a cost of 5c. per pound, deducting gold and silver values, and is in an exceptionally strong position, financially and otherwise, with an excellent management.

UTAH CONSOLIDATED GOLD MINE, LTD.**UTAH.**

A British corporation, reorganized under laws of New Jersey as Utah Consolidated Mining Co., to obviate payment of heavy English taxes.

UTAH COPPER CO.**UTAH.**

Office: Colorado Springs, Colo. Mine office: Bingham Canyon, Salt Lake Co., Utah. Organized June, 1903, under laws of New Jersey, with capitalization \$4,500,000, shares \$10 par. Bonds, \$750,000, at 7%. Chas. N. MacNeill, president; Chas. L. Tutt, vice-president; Spencer F. Penrose, secretary and treasurer; D. C. Jackling, general manager; Frank G. Janney superintendent; Henry Colvin, assistant superintendent; John McDonald, mine superintendent.

Lands, 100 acres, lying on both sides of Bingham Canyon, formerly owned by the De Lamar-Wall Mining & Smelting Co., also 320 acres, bought in 1903 from the West Mountain Placer Co., for \$75,000, and a 320-acre millsite near Garfield Beach, Saltair, Great Salt Lake, this site being 10 miles north of Bingham, with which it is to have rail connections. The Saltair property has several good springs, one with a flow of 3,000 gallons per minute, giving a water supply adequate for a 3,000-ton concentrator. The lands lie on both sides of the gulch, permitting ore extraction by tunnel to great depth. The ore body is of a most unusual character, being a soft, decomposed, friable porphyry, carrying 0.75% to 3% copper, with an average of slightly under 2%. This material concentrates excellently, and notwithstanding its apparently unfavorable character, stands well in the mine, permitting the use of a minimum of timber, and is mined on the caving system. The mine has a Cornish pump, of 1,800 gallons capacity, and electric traction is to be installed in 1905. The ore body is, perhaps the largest in the world, so far as mines have been opened yet, there being an area of approximately 2,000 x 3,000' carrying ore for a known depth of 500', without barren rock yet encountered at any point, by tunnels, or drill holes, the diamond drill having been used extensively in probing the property. The ore is exclusively disseminated chalcopyrite averaging slightly under 2% copper, 0.5 oz. silver and 0.03 oz. gold per ton. Eventually steam shovels may be used and the property worked open-cast, but present development is by tunnels. Owing to the altogether unusual nature of the ore body, the Utah is essentially a quarrying proposition, like the Rio Tinto or Granby, but for a time at least

extraction will be through tunnels. The plan of development is unique, and adaptable only to a property of this most unusual nature. Mine openings are rectangular, laid out like the streets of a city, with blocks above blocks, like the successive floors of a building. There are 13 tunnels, entering the hills at approximately right angles to the gulch. These tunnels are avenues, and crossing the avenues at right angles, parallel with the gulch, are streets, these being opened 150' apart. Paralleling the tunnels or avenues are drifts, corresponding to alleys in the cities, these being 75' from the avenues on either side. The tunnels are 10x10' or larger, and all openings are of exceptionally large dimensions, connections between the various floors being secured by upraises from alley to alley. The avenues, streets and alleys are named on the same system as is used in the street nomenclature of Salt Lake City—a method difficult of plain description in type, but readily comprehensible in the ground. In all, about 5 miles of avenues, streets and alleys have been opened.

The concentrator, capacity 800 tons daily and costing about \$300,000, is so planned that it can be increased, in units, to an ultimate capacity of 6,000 tons daily. The plant is about 1½ miles below Bingham and near the mine, receiving ore over a spur of the Bingham branch of the Rio Grande Western railway. The railway track enters the mill over a trestle, and ore cars are dumped into bins beneath the track and ore drawn thence through chutes to a 200' belt-conveyor, which carries the ore to the crushers. The crushing department, 26x44', has two 1200-ton Gates crushers, two sets of 36" and 30" Gates rolls, 6 Chilean mills, 6 hydraulic classifiers, 6 revolving screens, 18 six-foot Frue vanners, 32 Wilfley concentrators, 2 Overstrom tables, 2 Card tables and 2 Wilfley slimers. The boiler house, 36x100', has eight 75-h. p. tubular boilers, with automatic stokers, and engines of 125 h. p., 150 h. p., and 350 h. p. This mill, designed by Mr. Jackling, is exceptionally well planned, and thoroughly successful in operation, securing high concentration at low cost, with a minimum of sliming and tailings losses.

The copper production of 1904 is estimated at 3,000,000 lbs., and was at the rate of about 600,000 lbs. monthly at the close of the year. Concentrates are sold, under a contract expiring 1912, to the American Smelting & Refining Co. The company is said to be netting about \$1 per ton from its porphyry ores, and the quadrupling of the present concentrating plant in 1906 is under consideration. Mining and milling costs are very low. The management of the Utah Copper Co. is composed, not of theorists, but of practical miners and metallurgists, who have been highly successful in Colorado and other mining fields.

The significance of the work being done by the Utah Copper Co. seems to have escaped general consideration. At no point on the globe are there developments of greater importance, or that are likely to have a more profound and far-reaching importance upon the future of the copper industry. It is not beyond the bounds of possibility that the Utah Copper Co. is the pioneer in solving the question of the world's future copper supply—a question that has been given much serious consideration during the past few years by the largest

consumers of the metal. The mining work of the Utah Copper Co. is an evolution, yet it may prove to be also the beginning of a revolution.

Heretofore the world's supply of copper has come from nature's concentrated deposits of copper ore and native copper. The Utah people have gone to the original repository of the metals—the rock magma from which, by cunning processes of leaching, precipitation and concentration, Dame Nature has brought the disseminated chalcopyrite up to deposits of workable grade. The porphyry worked by this company undoubtedly has been enriched to some extent since expelled from a vent in the earth's crust aeons ago, yet the mine must be regarded as a step in advance of anything heretofore accomplished in mining. The mine of the Utah Copper Co. is not opened on a vein, lense or stockwork, but upon the original magma, or mother matrix, whence have come our mineral values. The Utah has gone down to the backbone of nature for its ores, and the success of the company, which no longer seems open to question, will open a new and vast field of possibilities in the mining world.

The Utah Copper Co. has, so far as known, the largest ore body of any metal ever opened at any time in any part of the world. Its ore body, so far as proven by openings and the drill, contains fully 250,000,000 tons of ore, carrying approximately five million tons of fine copper, one hundred and twenty-five million ounces of silver and seven million five hundred thousand ounces of gold, metals worth, at the current market prices, about seventy-five millions of dollars for the silver, one hundred and fifty millions for the gold, and fifteen hundred millions of dollars for the copper, which should be produced at an ultimate profit of one hundred and fifty millions to two hundred and fifty millions of dollars.

The doubters who have feared that Bingham might not prove a permanent camp will find scant comfort in the foregoing figures.

UTAH & EASTERN COPPER CO.

UTAH.

Office: 42 Church St., New Haven, Conn. Mine office: Shem, Washington Co., Utah. Organized February, 1901, under laws of West Virginia, with capitalization \$1,500,000, shares \$5 par. Chas. E. Graham, president; Louis E. Stoddard, secretary and treasurer; Chas H. Doolittle, general manager. Lands, 11 patented claims, area 220 acres, including the old Dixie mine, also a 40-acre smelter-site, in the Tutsagubet district, showing 5 fissure veins, with estimated average width of 40', giving average assays of 15% copper, from oxide and carbonate ores. Principal development is by a 775' blind shaft, sunk from breast of a 225' tunnel, giving about 100,000 tons of ore in sight. A new 700' vertical shaft, to replace the incline, is to be completed about March 1, 1905. Has steam and water power at smelter, and gasoline power at mine, with a good mining equipment. The old 25-ton smelter, inconveniently located, is idle, and a new 100-ton smelter is in blast. Production of fine copper in 1903 was 1,550,000 lbs., made in 177 days smelter run, and production for 1904 was 1,448,597 lbs. fine copper. Property has a good management and is regarded as valuable.

UTAH-NEVADA COPPER CO.

Office: Exchange Bldg., Denver, Colo. Lands are said by company to be in 320 acres in the Keg Springs district.

UTAH-NEVADA GOLD & COPPER MINING CO.**UTAH.**

Office: care of David Jensen, vice-president, Ogden, Utah. Organized 1903, with capitalization \$400,000, shares \$1 par. J. Stanley Dee, president; J. C. Delamar, secretary; W. D. Pyper, treasurer; Thomas Cunningham, superintendent. Lands, 6 claims, in the Newfoundland district of Box Elder and Weber counties, Utah, opened by sundry open cuts and shafts of 50' and 70', showing 2 veins 3' to 5' width, carrying chalcopryite with pyrite and quartz gangue, assaying up to 32% copper, 17 oz. silver and \$12 gold per ton.

UTAH QUEEN MINE.**UTAH.**

Mine office: Bingham Canyon, Salt Lake Co., Utah. Morris R. Hunt, superintendent, at last accounts.

UTAH SOUTHERN GOLD & COPPER MINING CO.**UTAH.**

Office: 25 Broad St., New York. Organized April 10, 1903, under laws of Utah, with capitalization \$500,000, shares \$1 par; issued, \$408,750. Felix Gottschalk, president; H. A. Crosby, secretary and treasurer. Lands, sundry claims in the Beaver Lake district of Beaver county, Utah.

UTICA MINING & MILLING CO.**COLORADO.**

Office: 1420 Chestnut St., Philadelphia, Pa. Mine office: Ward, Boulder Co., Colo. G. A. Davison, superintendent. Ores carry gold, silver and copper. Has water power and 20-stamp mill.

VAL CASTRUCCIO MINES.**ITALY.**

Mine office: Massa Maritima, Grosseto, Italy

VAL D'ELSA COPPER CO., LTD.**ITALY.**

Letter returned unclaimed from former office, Glasgow, Scotland.

VAL VERDE COPPER CO., LTD.**ARIZONA.**

Practically bankrupt. Smelter sold to Bradshaw Mountain Copper Mining & Smelting Co., leaving the Val Verde in debt, and with no assets except undeveloped lands of doubtful value. Fully described in Vol IV.

VALDEZ, COPPER RIVER & YUKON RAILWAY CO.**ALASKA.**

A stock-jobbing proposition, promoted by the notorious L. E. Pike & Co., of 17 Milk St., Boston, Mass.

VALENCIA COPPER MINING CO.**CALIFORNIA.**

Office: Hayward Bldg., San Francisco, Cal. Letter returned unclaimed from former mine office, Sherwood, Trinity Co., Cal. Organized under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Chas. E. Lau-meister, president; J. E. Manning, secretary and treasurer; F. P. Burris, superintendent. Lands, 12 copper claims, area 248 acres, also 3 quartz-gold claims, area 62 acres, and 250 acres of placer-gold claims. all well watered and timbered, on the East Fork of New River, near the summit of the Trinity-Salmon range with extensive water-rights, including two falls of 150' each. The copper claims carry a heavy gossan capping and are slightly developed by 2 tunnels.

SOCIEDAD VALENCIANO-ANDALUZA DE ALTOS**SPAIN.****HORNOS y MINAS DE PEÑAFLO.**

Office: Glorieta, 1, Valencia, Spain. Mine office: Peñaflo, Sevilla, Spain. Capitalization, 1,500,000 pesetas, shares 250 pesetas par. Don Baldomero Deu, president and agent. Property is the Elvira mine and extensions, carrying copper and iron pyrites, at Peñaflo, and a group of claims, area 144 hectareas, at the Pueblo de los Infantes, Sevilla. The Peñaflo group is being developed, but is not yet a producer.

VALENSUELLA COPPER CO.**ARIZONA.**

Office: 3543 W. 23d Ave., Denver, Colo. Mine office: Quartzite, Yuma Co., Ariz. Employs 8 men. Organized November, 1901, under laws of Arizona, with capitalization \$1,250,000, shares \$1 par. Richard Darling, president and general manager; F. W. Deidesheimer, treasurer; Geo. C. Foulkes, secretary. Lands, 7 claims, patented, area circa 100 acres, also a 60-acre mill and smelter site, in the Quartzite district. Country rocks are limestone and schists, showing 2 contact veins, developed by shafts of 200' and 270', giving average assays of 12% copper, 4 oz. silver and \$4 gold per ton, from malachite, azurite and oxide ores. Has 1,050' of underground workings, showing ore bodies of considerable size. Has gasoline power, with 2 hoists, good for depth of 500' each, 2 engine-houses and smithy, each 18x24', and 6 dwellings. Is installing a 30-ton Vulcan smelter at the mine. Property is 70 miles from the Southern Pacific railroad, and 15 miles from steamer landing on the Colorado river, supplies being received by water.

VALENTINE COPPER & GOLD MINING CO.**UTAH.**

Office: Salt Lake City, Utah. Mine office: Bingham, Canyon, Salt Lake Co., Utah. J. W. Cairns, president and manager. Organized, 1904, with capitalization, \$150,000. Made several small shipments of high-grade ore to local smelters in 1904, and is said to have a vein carrying a 2' pay-streak of excellent ore.

VALEO MINING CO.**UTAH.**

Mine office: Park City, Summit Co., Utah. Hon. Thos. Kearns, general manager; J. P. Boyle, superintendent. Ores carry gold, silver and copper. Has steam power and employs about 25 men.

VALERIE MINE.**YUKON.**

A Yukon property by this name made a small shipment of copper ore, in 1903, to the Crofton smelter.

MINA VALLENARINA.**CHILE.**

Office and mine: Taltal, Antofagasta, Chile. Pedro Herrera, owner and manager. Employed about 25 men at last accounts.

VALLEY MINING CO.**COLORADO.**

Office: Iowa City, Ia. Mine office: West Cliff, Custer Co., Colo. Chas. S. Magowan, president; John I. Christie, secretary; Saml. E. Palmer, general manager; Harry Triplett, mine superintendent; Frank L. Card, mill superintendent. Organized under laws of Colorado, with capitalization \$150,000, shares \$1 par. Lands, 6 patented claims, area 72 acres, also a 20-acre mill-site, in the Silver Cliff district, with 6 veins of 2' to 2' width, opened by

shafts of 175' and 280', with 1,300' of underground openings, securing average assays of 2.5% copper, 17% lead, 1% zinc, 10 oz. to 13 oz. silver and \$4 gold per ton, from oxidized ores with occasional native copper. Has a 75-h. p. steam plant at mine, with 2 hoists and an air-compressor, and a 60-ton concentrator, 50x175', of brick and wood, with a 150-h. p. steam plant, 18" Blake crusher, 2 trains of rolls, 6 Card concentrating tables, 2 sizers and 500' of canvas slime-tables. Employs about 50 men.

VALLEY VIEW MINING CO.

CALIFORNIA.

Office: San Francisco, Cal. Mine office: Lincoln, Placer Co., Cal. Lands, 90 acres, patented, showing impregnations 250' wide, with about 25' of ore, between schistose walls. Has a gossan outcrop, nearly 100' wide and 1,000' long, carrying average gold and silver values of about \$4 per ton. Ore shipped averages about 5% copper. Has two 5' Huntington mills.

VALLEY VIEW MINING CO.

MONTANA.

Letter returned unclaimed from Anaconda, Deer Lodge Co., Mont.

VALRUBIO GROUP.

SPAIN.

Offices: care of M. Yglesias, owner, 2 Tokenhouse Bldgs., London, E. C., Eng. Mine office: Paimogo, Huelva, Spain. Property includes the Valrubio, San Carlos and San Andres mines, with total area of about 200 acres, these being the western extensions of the San Vicente veins, and lying between the Romanera and Monterubio groups.

VAN ANDA COPPER & GOLD MINES CO., LTD. BRITISH COLUMBIA.

Property was leased to the Van Anda Mines & Smelter, at last accounts.

VAN ANDA MINES & SMELTER.

BRITISH COLUMBIA.

Office and mines: Van Anda, Texada Island, B. C. T. J. Vaughan-Rhys, general manager, at last accounts. Lands, 20 claims, area 840 acres, in the Nanaimo district, including the Copper Queen and Cornell mines, opened by shafts of 80', 150', 460', and 500', with tunnels aggregating about 4,000' in length, and with a total of about 12,000' of underground openings, leased July, 1902, from the Van Anda Copper & Gold Mines Co., Ltd. Mines show bornite and chalcopryite, estimated to average about 8% copper, 2.5 oz. silver and \$1 gold. Has a steam plant, with 3 hoists, 5-drill Rand compressor, 5 pumps and power drills, a sawmill with dairy capacity of 20,000', warehouse, and substantial shipping wharf. Reduction plant, one mile from the mines, and connected therewith by tramway, has a 50-ton circular furnace and 75-ton rectangular furnace, with sampling mill, crushers, etc. Work suspended in December, 1904.

VANCOUVER & BOUNDARY CREEK

BRITISH COLUMBIA.

DEVELOPMENT & MINING CO.

Mine office: Penticton, Yale & Cariboo district, B. C. C. Vacher, manager. Ores carry gold, silver and copper. Has steam power.

VANCOUVER ISLAND MINING &

BRITISH COLUMBIA.

DEVELOPMENT CO., LTD.

Offices: 45, Leadenhall St., London, E. C., Eng. Mine office: Duncans, Vancouver Isld., B. C. Organized Nov. 18, 1902, with capitalization £50,000, shares, £1 par; issued, 27,420 shares, 12s. 6d. paid in. F. H. Faviell, chair-

man; Clermont Livingston, general manager; J. J. Fifield, secretary. Lands, sundry claims, lying east of the Tyee. The Westholm claim has a 500' two-compartment working shaft. Drifts on the 500' level show a wide mineralized zone, with occasional concentrations of copper. While nothing of great value has been found yet, the lands are well located, and the local management is of the best.

COMPANÍA FERROVARRIA VASCO-CASTELLANA.

SPAIN.

Office: Madrid, Spain. Mine office: Burgos, Spain. Property is the Mina de Pineda, near Burgos, now undergoing development.

VEILED PROPHET COPPER CO., LTD.

ARIZONA.

Office: 27 William St., New York. Mine office: Clifton, Graham Co., Ariz. Capitalization \$500,000, shares \$1 par. Ben M. Crawford, general manager. Lands, 5 claims, area 100 acres, near the Shannon, Standard and New England & Clifton mines, developed by open-cuts and short tunnels, showing high-grade surface ores, giving assays of 16% to 20% copper, and concentrating ores giving assays of 4% to 8% copper, with an average of about 6 oz. silver and \$4 gold per ton. Presumably idle.

VELARDEÑA MINING & SMELTING CO.

MEXICO.

Office: Omaha, Neb. Mine office: Velardeña, Durango, Mex. Is controlled, through ownership of majority of stock issue, by the Guggenheim Exploration Co. which paid \$5,000,000 gold for 60% of the stock, and guaranteed to expend \$1,000,000 additional in developments and betterments. John R. Bapty, general manager; M. Dahlgren, mine superintendent; Wm. Daly, smelter superintendent.

Lands, 2,500 pertenencias, area 6,177 acres, including a number of mines, of which the Terneres and Santa Maria silver-lead mines and the Copper Queen copper mine are the more developed, and are the principal producers controlled by the Velardeña company. The ores of the Copper Queen are argentiferous.

The mines and smelter, 24 miles apart, are connected by the Velardeña railway, connecting at Velardeña, the site of the smelter, with the Mexican International railway. The concentrator, of 400 tons daily capacity, is said to have cost \$250,000, Mexican. The old smelter is to be abandoned upon completion of the new plant. The new smelter, of 1,000 tons daily capacity, is so planned that it can be enlarged readily at any future time if found necessary. The new smelter will have both lead and copper stacks, and it is generally stated that a custom smelting business will be done, though this would seem a violation of the friendly understanding maintained heretofore between the Guggenheim Exploration Co. and the American Smelting & Refining Co.

A 3,000-h. p. plant, to utilize water falls, is planned to have five 350-kw. generators, and a 50-mile transmission line to the mines and works. The Velardeña is an exceptionally promising property, and under its present capable and energetic management should become one of the leading mines of the republic within the next few years.

VELVET (ROSSLAND) MINE, LTD.**BRITISH COLUMBIA.**

Merged, 1904, in Velvet-Portland Mine, Ltd.

VELVET-PORTLAND MINE, LTD.**BRITISH COLUMBIA.**

Offices: 23, Leadenhall St., London, E. C., Eng. Mine office: Rossland, Trail Division, Yale District, B. C. G. B. Mee, chairman; W. A. Stearns, secretary; S. Severin Sørensen, general manager; Wm. Thompson, consulting engineer. Organized Jan. 6, 1904, as an amalgamation of the Portland-Rossland Mine, Ltd. and the Velvet (Rossland) Mine, Ltd., with capitalization £125,000, shares, 10s. par; issued, £74,947. Lands, sundry claims on Sophie Mountain, Rossland, carrying auriferous copper ores, said to average about \$14 per ton in value. Has a small concentrator with three Tremaine two-stamp mills, two Overstrom tables, two sets of Brown's hydrometric classifiers, and one Jenckes crusher. Mill is being enlarged to capacity of 75 tons, and puts five tons into one. Concentrates are sent to the Northport smelter for treatment. Mine has a good steam plant.

VENICE COPPER CO.**MEXICO.**

Office: Venice, Ill. Letter returned unclaimed from former mine office, Soyopa, Sonora, Mexico. Lands supposed to have been sold to the Calumet & Yaqui River Copper Co.

VENTURA-COLORADO COPPER MINING & SMELTING CO.

Incorporated, 1903, under laws of Colorado, by D. H. De Arman, et al.

VENTURE HILL MINING CO.**ARIZONA.**

Office and mines: Jerome, Yavapai Co., Ariz. Organized 1900, under laws of Arizona, with capitalization \$3,000,000, shares \$1 par. Thos E. Campbell, president and general manager; Geo. H. Avery, vice-president and superintendent; Chas. F. Avery, secretary; Frank E. Jordan, treasurer. Lands, 6 patented claims, area 110 acres, in the Verde district, showing 2 fissure veins, estimated by company to average 90' width, and to carry average values of 4.7% copper, 6.5 oz. silver and \$4 gold per ton, from oxide and sulphide ores, developed by shafts of 65' and 87', and tunnels of 205' and 457'. Employed 6 men at last accounts.

VERDE APEX COPPER CO.**WYOMING.**

Supposed to have copper claims somewhere in Wyoming.

VERDE APEX COPPER MINING CO.**ARIZONA.**

Letters returned unclaimed from former office, 66 Broadway, New York. Mine office: Jerome, Yavapai Co., Ariz. Organized 1900, with capitalization \$3,000,000, shares \$1 par. Chas B. Lutz, Bloomsburg, Pa., president; F. E. Jordan, agent. Lands, 6 claims, area circa 90 acres, in Mescal Gulch, about one mile south of Jerome, slightly opened by shaft and tunnel. Company out of cash at last accounts.

VERDE CHIEF MINING CO.**ARIZONA.**

Office: 1506-20 Broad St., New York. Mine office: Jerome, Yavapai Co., Ariz. Organized under laws of Arizona, with capitalization \$3,000,000, shares \$1 par. Dr. Clarendon A. Foster, president; Henry T. Rogers, secretary; C. H. Acker, superintendent. Lands, 10 claims, 7 miles south of Jerome, with about 1,700' of underground openings, showing auriferous and argentiferous copper ore. Idle at last accounts.

VERDE CONSOLIDATED COPPER CO.**ARIZONA.**

Office: Prescott, Ariz. Mine office: Jerome, Yavapai Co., Ariz. Jacob Marks, president; T. E. Campbell, secretary and treasurer. Capitalization \$1,500,000, shares \$1 par.

VERDE GRANDE COPPER CO.**MEXICO.**

Office: 308 North Sixth St., St. Louis, Mo. Mine office: Apartado 98, Hermosillo, Sonora, Mex. Employs about 120 men. Organized 1901, under laws of Arizona, with capitalization \$2,500,000, shares \$5 par. C. P. West, president; R. D. Wood, treasurer; Thomas Tyson, secretary; Jairus D. Fresh, general manager; Jas. Penman, superintendent. Lands, 500 acres, in the Ures district, about 40 miles northwest of Hermosillo, lying about 2,000' above sea-level, partly timbered with ironwood, cottonwood, and mesquite. Water is scarce on surface, but can be developed by wells. The main tract of 460 acres includes the Verde Grande, La Verde, La Cobriza and San Luis groups, showing veins of 10' to 100' width, largest veins being low in grade. The Verde Grande group shows veins and deposits in limestone, in a secondary eruptive formation, ores assaying about 6% copper, 6 oz. silver, and \$1 gold per ton. La Verde and La Cobriza groups show a contact vein, between granite and quartzite, having a gangue of talcose limestone interstratified with granite and quartz, this vein being 30' to 60' wide and traceable about 7,000', giving assays of 5.5% to 16% copper, with high gold and silver values. Mines are developed by 16 different shafts and tunnels, with about 4,000' of underground openings, estimated by company to show 200,000 tons of ore. A smelter, 1½ miles from the principal mine openings, with a 100-ton Allis-Chalmers water-jacket blast-furnace was completed 1904, but apparently is idle. A leaching plant was being installed at the end of 1904. The company has made many exaggerated statements regarding its properties, in placing stock, but the showing of ore secured is encouraging, and with proper management a successful mine may be made. Present management is not responsible for tergiversations of former officers. Company supposed to be considerably in debt to sundry heavy shareholders, who advanced funds to keep the property going.

VERDE GROUP.**CALIFORNIA.**

Mine office: Redding, Shasta Co., Cal. A group of 12 claims adjoining the Shasta King group of the Trinity Copper Co., opened by a 600' cross-cut tunnel showing a small vein of good copper ore.

VERDE KING COPPER CO.**ARIZONA.**

Office: 401 Henne Bldg., Los Angeles, Cal. Mine office: Jerome, Yavapai Co., Ariz. Organized 1900, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Chas. J. George, president; Baron W. Riley, secretary; Joseph Gray, superintendent. Lands, 20 patented claims, adjoining the United Verde mine on the south, with about 3,000' of openings, including a 200' two-compartment working shaft, planned to be sunk 600'. Assays of ore have given 11.5% to 24.5% copper, with gold and silver values. Lands are well located and are considered promising.

VERDE MINING & MILLING CO.**WYOMING.**

Office. 523 Bee Bldg., Omaha, Neb. Mine office: Battle, Carbon Co., Wyo. Organized, 1900, under laws of Wyoming, with capitalization \$1,500,000, shares \$1 par. C. M. Jacques, president; J. E. Thatcher, secretary and treasurer; J. F. Hinton, general manager. Lands, 4 claims, area 80 acres, showing a 35' fissure vein giving assays of 5% to 21% copper, 6 oz. silver and \$5 gold per ton, from malachite, bornite and chalcopyrite. Has 3 shallow shafts and steam power. Idle.

VERDE QUEEN COPPER CO. OF ARIZONA.**ARIZONA.**

Letters returned unclaimed from former offices, 39 Cortlandt St., New York, and Marietta, Ohio. Lands, 28 claims, with a 40-ton smelter, near Jerome, Yavapai county, Arizona. Lands not sold to United Verde in 1904, as has been asserted.

FRANCISCO VERGARA I.**CHILE.**

Office and mine: Petorca, Aconcagua, Chile. Owns and operates the Mauro mine, opened 1860, making about 100 long tons of copper yearly, shipped as matte.

VERMONT & ARIZONA COPPER CO.**ARIZONA.**

Office: 150 College St., Burlington, Vt. Mine office: Tombstone, Cochise Co., Ariz. Organized 1899, under laws of Arizona, with capitalization \$1,500,000, shares \$5 par. Hon. Hamilton S. Peck, president; J. H. McLoud, secretary and treasurer; J. A. Collier, superintendent. Lands, 11 claims, area 230 acres, in the Turquoise district, on the western slope of the Dragoon Mountains, showing 2 gold and silver veins and several copper veins, latter giving assays of 23% to 43% from selected carbonate ores, and opened by a 230' main shaft, with 1,500' of underground openings, with about 1,000' of development on 10 adjoining claims. Has steam power.

VERMONT & BOSTON MINING CO.**VERMONT.**

Office: 113 Devonshire St., Boston, Mass. Letter returned unclaimed from former mine office, Berkshire, Franklin Co., Vt.

AKTIESELSKABET VESTERDALENS KOBBERGRUBER.**NORWAY.**

Office: Melderstein, Sweden. Mine office: Naevefjord, Norway. Employs about 60 men. Henning Nordlund, chairman; August Siljeström, superintendent. Organized 1903, under laws of Norway.

VICKERY-THOMPSON MINING CO.**MEXICO.**

Office and mine: Ocotlán, Oaxaca, Mex. Frank A. Vickery and Guillermo W. Thompson, managers. Ores carry values in gold, silver, copper and lead. Employs about 100 men.

VICTOR BONANZA MINING CO.**CALIFORNIA.**

Office: care of M. T. Dooling, president, Hollister, Cal. Letter returned unclaimed from former mine office, Dos Palos, Merced Co., Cal.

VICTOR CONSOLIDATED MINING CO.**UTAH.**

Mine office: Eureka, Juab Co., Utah. Vivian McCune, general manager; J. Treloar, superintendent. Mines are the Victor, Boss Tweed and others producing gold, silver and copper. Has steam power and employs about 50 men.

**GEWERKSCHAFT VICTORIA BLEIERZ- UND
ZINKBLENDE GRUBEN.****GERMANY.**

Office: Köln, Germany. Mine office: Nassau a/L., Rheinprovinz, Germany. Lands, 370 hectares, carrying ores of silver, lead, zinc and copper.

VICTORIA BOULDER MINING CO.**COLORADO.**

Mine office: Salina, Boulder Co., Colo. M. B. McClure, manager. Ores carry gold, silver and copper. Has steam power and employs about 25 men.

VICTORIA COPPER CO.**AUSTRALIA.**

Reorganized repeatedly. Now the African & Australian Co., Ltd.

VICTORIA COPPER MINING CO.**MICHIGAN.**

Office: 539-53 State St., Boston, Mass. Mine office: Victoria, Ontonagon Co., Mich. Employs 95 men. Organized, 1899, under laws of Michigan, with capitalization \$2,500,000, shares \$25 par; \$11 paid in. Calvin Austin, president; Chas. D. Hanchette, vice-president; Jas. P. Graves, secretary and treasurer; preceding officers, Wm. F. Humphreys and Fred H. Williams, directors; Thos. Hooper, superintendent; Geo. Hooper, mining captain; C. R. Forbes, engineer; C. R. Everett, clerk.

Official returns to the state of Michigan, as of date Jan. 1, 1904, disclose the following figures:

Amount cash paid in on capital stock.....	\$1,000,000.00
Entire amount invested in real estate	372,722.91
Amount of personal estate	272,220.09
Amount due corporation	3,047.00

At the close of business Dec. 31, 1904, the company had assets of \$110,375.95, with liabilities of only \$1,830.65, giving a balance of assets, all cash, except 969 shares of the company's stock, of \$108,545.30.

Lands, 2,249 acres, in Sections 19, 20, 29, 30 and 31, Town 50 North, Range 39 West, and Sections 24, 25 and 36, T. 50 N., R. 40 W., in Ontonagon county, Michigan, giving a tract with an extreme width of two miles east and west, and an extreme length north and south of $2\frac{3}{4}$ miles, lying just west of the Ontonagon river. Practically all of this land is on the mineral belt, only about 100 acres lying on the Eastern Sandstone. Neighboring mines, all idle for many years, are the West Minnesota on the north, National on the east and Devon on the west. Nearest active property is the Michigan, three miles northeast.

The first attempt at Lake Superior copper mining, in historic times, was made on the Victoria property, in the winter of 1770-1771. The next mining done was in 1849, when the property was opened under the name of the Cushin, on a line of prehistoric pits containing masses of native copper, one upwards of a ton in weight. Name was changed to Forest mine, 1850, and property was reorganized as the Victoria Mining Co. in 1858. Under these titles produced 186 tons, 1,279 lbs. refined copper, at a loss of about \$180,000. The first stamp-mill was burned by a forest fire and the second was swept away by a flood. The property was operated regularly, on a small scale, 1849-1855, and thereafter by spasms. The mine was unwatered in 1881, but was not reopened then, and remained idle until 1899.

The Victoria is located on a high and steep hill, notwithstanding which the solid rock is covered with heavy sand and clay drift. The Forest amygdaloid lode, on which the mine is developed, is 5' to 30' wide, where opened, very irregular in width, rolling in dip and bunchy in contents. Strike is about N. 69° E., with an average dip of 61° to the northwest, the strike giving about 1½ miles of outcrop on Victoria lands. The Forest bed is evidently one of the cupriferous amygdaloids of the Evergreen belt, opened to the northeast by the Mass and Adventure, but which one of the series is uncertain. Work was begun March 1, 1899, by the present company, under very great disadvantages. The old mine had four shafts, numbered from east to west, opened very erratically, with shafts and levels at a variety of intervals, lifts being opened at distances of 55' to 65'. Old No. 2, chosen for the main working shaft, was cut down to two-compartment size, and in cutting this shaft down from the adit to the third level, considerable barrel work and good stamp-rock was found in what was the footwall of the old mine. No. 2 is 8x12', inside measurement, with two compartments, and was 2,089' deep at the close of 1904. Levels below the fourth are opened 100' apart. The formation is much disturbed near the surface and the lode is irregular in dip, but with the widening noted at depth more regular walls are found also, as well as a considerable increase in copper, showing some good stoping ground from the seventh level downward until at the bottom, where the lode widens to about 80', with only occasional bunches of copper. Old No. 1 shaft, 240' east of No. 2, is 188' deep; old No. 3 is 350' deep and No. 4 is 180' deep. Nineteen levels have been opened and on Dec. 31, 1904, the mine had 26,803' of underground openings. In addition to productive openings on the Forest lode the mine has about 3,000' of crosscuts, showing sundry cupriferous beds, but none of promise equal to the Forest. The footwall crosscuts show an amygdaloid underlying the Forest at an average depth of only 6', this bed being well mineralized for 4' to 5' along the footwall, producing small masses up to 50 lbs. weight, the copper occurring mainly on the foot, with considerable epidote on the hanging wall. Underlying this epidotal bed some 60' is a 6' amygdaloid, showing much epidote and allied minerals and a little stamp rock. An amygdaloid called the Glenn was opened in 1900, giving a fair showing of copper at the bottom of a shallow shaft. Diamond drill borings north of the mine have shown nothing of especial promise. The Forest amygdaloid is low in grade, but quite regular in contents, showing a little heavy copper, but with values mainly in medium-grade stamp rock. All levels down to the 18th are connected by winzes, giving ventilation and safety. The ground stands well and the mine is without a stick of timber, except in the shafts. About 400,000 tons of stamp rock have been developed, and a considerable stock-pile has been accumulated on surface, from opening work. The copper chute at the Victoria rakes to the southwest, and the best ground below the 15th level will be found in the southwestern drifts. Little mining work has been done since July, 1904, nor will be until the completion of the stamp mill.

No. 2 has a frame shafthouse, 32x34' and 45' high, with a 16x36" ell.

The engine-house and boiler-house is 24x58', with a 24x28' ell, of wood on stone foundations, with steel roof. There are two 12-drill air-compressors, operating 20 power drills, two 125-h. p. boilers and a portable boiler. A Webster, Camp & Lane conical-drum single-skip direct-connected duplex-cylinder hoist, good for 3,000' depth, is on the ground and can be installed in a few weeks, whenever needed, and the present Nordberg hoist, with 12x28" cylinders and 5' drum with face of 6' 9", will be removed to the site of the new No. 3 shaft, 1,190' west of No. 2, which will be sunk on the same lode and at the same angle as No. 2. The old hoist at No. 2 is rated as good for 1,200' only, but No. 2 shaft has been sunk nearly 2,100' with it.

Buildings at the mine include a 30x60' machine shop, of wood, with iron roof, a 24x72' carpenter shop and warehouse, a two-story frame boarding-house and office, 27x64', with 10x37' ell, a 19x41' frame schoolhouse, stone changing-house and 58 dwellings. The company also owns and operates a store, for the benefit of employees. A 10x16x28' storage cistern holds water from the mine for feeding boilers, and water for domestic uses and fire protection is pumped by a steel windmill from a well having a storage tank and 750' of water mains. There is a sawmill, with 56" circular saw, furnishing timber and lumber for the mine's requirements. Nearest railroad is the Chicago, Milwaukee & St. Paul, at Rockland, 3 miles distant, but connection may be given also by the Holt logging railroad. The company's lands are well timbered and contain an inexhaustible supply of good building stone.

The millsite is being connected with the mine by a 4,400' gravity tram line having a 9% grade. Loaded cars will raise the empties by a cable passing over a drum at the top, and operating in counterbalance. The millsite, near the hydraulic works, has a solid sandstone floor, which has been capped by a bed of concrete, and all heavy machinery will be anchored therein by eye-bolts cemented into the rock. The old mill of the Belt mine was bought and the machinery is being installed in the Victoria mill. The plant includes one Cuyahoga stamp-head, 12x16" engine, jigs, etc., and will be supplemented by additional modern washing machinery. Capt Hooper, who is an experienced mill man, will depart from the common milling procedure of the Lake district in a few minor details of mill practice.

A large water power is being developed from Glenn Falls, on the west branch of the Ontonagon river, about 1 mile from the mine. This is much the best natural water power of the Lake Superior copper district, the stream dropping nearly 150' in 1½ miles, by a series of small falls, between which are numerous rapids with sandstone bottoms. Power is developed by means of a dam, canal and shaft. The dam, built up from excavations in the bedrock, is 320' between abutments, and has 32 eighteen-inch "I" beams, 10' apart, sunk vertically 5' to 10' in bedrock, with cement filling. The dam has an extreme height of 24', with width of 14' at the bottom and 8' at the top, and has a 320' main section and wings of 100' and 160' giving a total length of 580', built with an arch up-stream, giving very great strength. The dam is faced on the water side with 5x10' plates of 3-16" steel, bolted

to the steel "I" beams through the concrete. The center of the dam has an apron 80' wide, also a floating boom to guide logs, as the stream is used for logging operations, the dam being so substantially built that it cannot be torn out by a log-jam. The outlet is a 44" steel pipe, leading from the bottom of the dam to the power canal.

The canal diverting water from the dam is nearly 6,000' in length, running for about 2,000' through sandstone and 4,000' through alluvium. The canal is 25' wide at the top, 16' wide at the bottom and 16' deep. The outlet of the canal has 6 gates, in two sets, separated by a heavy concrete abutment. The gateways are made of 20" "I" beams set vertically 6' apart, with 6 gates of heavy oak planking, worked vertically by rack and pinion actuated by water power. The canal leads to a 20x20' shaft, now sinking, which is to be nearly 300' in depth, and will connect at the bottom with a tail-race to the lower river. Instead of using turbines the water will be made to compress air at the bottom of the shaft, the power installation becoming a hydraulic air compression plant.

The hydraulic installation of the Victoria presents some rare features, and is worthy of a more extended description. From the foredam three inlet shafts will be sunk, vertically. These are 19' from center to center, and will be 5' each in diameter and 334' 6" deep. At present these three inlet shafts are merely 5" bore-holes, but will be reamed out, through solid sandstone. The reaming will be done by a special bit of 5' diameter, having 4 cutting arms, each 30" in length, and will be actuated by a No. 9 Rand air drill. Air will be led into these inlet shafts by 5,000 tubes, each of $\frac{3}{8}$ " diameter. The air so entrained will be carried downward as bubbles by the falling water. At the bottom of the three 5' inlet shafts is a tunnel, which will be 360' long and will lead to a large air compression chamber. The chamber will be fan-shaped, 26' high and of 60' width at one end, and 26' high by only 18' width at the other end. The rock work of the plant will be in dense sandstone throughout, and the imprisoned air will be compressed to a pressure of about 125 lbs. per square inch by the weight of the water, the compression chamber serving as a reservoir. The outflow shaft will be 16x20', sunk at an angle of 80°. Owing to the homogeneity and density of the sandstone strata, which are devoid of cracks, it is probable that no lining will be required for the compression chamber, though this can be furnished at any time, if found necessary. This novel hydraulic-pneumatic power plant should be completed before the close of 1905, and will furnish ample power for every requirement of the Victoria mine and mill.

The Victoria has been managed with great prudence and economy since its inception, and, by reason of its natural water power, will be given exceedingly cheap operating costs. The mine is not rich, but it will have the advantages of a skilful, experienced and economical management, and very cheap motive power, and should begin production late in 1905 or reasonably early in 1906.

VICTORIA COPPER MINING CO.

UTAH.

Mine office: Ashley, Uintah Co., Utah.

VICTORIA GOLD & COPPER MINING CO., LTD. BRITISH COLUMBIA.

Office. English Point, B. C. Capitalization \$1,000,000, shares \$1 par. Frank E. Starkey, president and general manager; Albert G. Starkey, secretary and treasurer. Lands, 200 acres, west of Rossland, Yale district, B. C.

FELIX VICUÑA.**CHILE.**

Office and mines: Barco, Higuera, Serena, Chile. Operates the Higuera mine, opened 1855, producing 800 to 1,000 tons of fine copper yearly, and also owns the Solitaria mine, 130' deep, opened in 1893; the Panchita mine, 350' deep, opened in 1850, and the San Ramon mine, 270' deep, opened in 1851. Last three properties were idle at last accounts.

SANTIAGO VICUÑA.**CHILE.**

Operates El Jirio mine, in the department of Freirina, Atacama, and the Astilleros mine in the department of Huasco, Chile. Former mine, opened 1896, makes about 1,000 tons of Chile bars yearly. El Astilleros mine, opened 1890, produces about 500 tons of bars yearly.

VIELLA COPPER CO., LTD.**SPAIN.**

Compulsorily wound up, February, 1903.

VIGSNES KOBBERVAERKS AKTIEBOLAG.**NORWAY.**

Office: Talbodgaden, 8B, Christiania, Norway. Mines include the Vigsnes and Stavanger, sometimes known as the Meraker mines, in the Røros district, south of Trondhjem, Norway. Deepest shaft is 2,389'. Were long the principal producers of Norway, and made 960 long tons of fine copper in 1895, but since idle.

VILLAGE BELLE GOLD & COPPER CO.**COLORADO**

Mine office: North Park, Routt Co., Colo.

VINDICATOR GOLD & COPPER MINING CO.**UTAH.**

Office: care of Sam T. Myers, secretary, Ogden, Utah. Geo. F. Busch, president. Capitalization \$1,000,000, shares \$1 par. Lands, sundry claims, slightly prospected, near Unitah, Weber county, Utah.

VIOLA GOLD & COPPER MINING CO.**WASHINGTON.**

Letter returned unclaimed from former office, 276 West Broadway, New York.

VIRGIN MINE.**ARIZONA.**

Office and mine: care of Wm. Baker, owner, Dewey, Yavapai Co., Ariz.

VIRGINIA BELLE GOLD & COPPER MINING CO.**ARIZONA.**

Office: 13 South 7th St., Minneapolis, Minn. Mine office: Vails, Pima Co., Ariz. Organized January, 1902, under laws of Arizona, with capitalization \$1,500,000, shares \$1 par; issued, \$1,000,000. John F. Wallis, president; C. F. Potter, Jr., secretary; Jas. H. Bennett, general manager. Lands, 8 claims, area 160 acres, also a 40-acre millsite, in the Rincon district, showing two contact veins between limestone and granite-porphry, opened by 4 shafts, deepest 260', carrying ores assaying 5% to 30% copper and \$5 to \$25 gold per ton. Control said to have passed, 1904, into hands of monied men residing in Winona, Minn.

VIRGINIA CONSOLIDATED COPPER CO.**VIRGINIA.**

Office: 518 Walnut St., McKeesport, Pa. Mine office: Stony Man.

Page Co., Va. Organized Oct. 15, 1901, under laws of New Jersey, with capitalization \$1,000,000, shares \$1 par. W. Harry Hamilton, president; Harry Dunshee, vice-president; J. M. Mackintosh, secretary; Thos. A. Dunshee, general manager. Lands, 300 acres, owned in fee, on Hoak Mountain, Page county, showing 3 parallel veins, one said to be a fissure in trap and two occurring as contacts between trap and quartzite. One vein, opened by a shaft of 320', with 950' of underground openings, averages 12' width and gives average assays of about 6% copper, 4 oz. silver and \$1.80 gold per ton, from carbonate ores, with occasional occurrence of native copper. Has a gasoline hoist and 3-drill air-compressor, and employed 10 men at last accounts.

VIRGINIA COPPER CO., LTD.

VIRGINIA.

Offices: 99 Cedar St., New York, and 95, Gresham St., London, E. C., Eng. Mine office: Highhill, Halifax Co., Va. Registered August 31, 1900, under laws of United Kingdom, with capitalization £300,000, shares £1 par. Commodore P. Vedder, president; F. M. Davis, vice-president; Jas. B. Van Woert, secretary; Richard Lamb, general manager; Evan Davies, superintendent. Lands, 1,617 acres, including the High Hill mine, in the Virgilina district, developed by 8 shafts of 140' to 300' depth, with about one mile of underground openings. Property shows 2 veins, giving assays up to 5.9% copper, 2 oz. silver and 80c. gold per ton, from highly silicious ores. Has a 350-h. p. steam plant and concentrator, reducing ores 11 into 1, concentrates being shipped to New York and Norfolk, Virginia, for smelting.

VIRGINIA COPPER MINING & SMELTING CO.

ARIZONA.

Mine office: Casa Grande, Pinal Co., Ariz. W. P. Guthridge, superintendent. Operates the Reward mine, producing argentiferous copper ore. Has steam power, and 30-ton water-jacket furnace. Employed 30 men at last accounts.

MINA VIRGINIA.

CHILE.

Mine office: Chañaral, Atacama, Chile. Manuel Hidalgo, owner; Fernando Hernandez, manager. Employed about 75 men at last accounts.

VITA RICA SILVER & COPPER MINING CO.

MEXICO.

Mine office: Charcas, San Luis Potosí, Mex. C. H. Hoffman, manager. Has steam power and employed about 20 men at last accounts.

MINA LA VIUDA.

CHILE.

Mine office: Caldera, Atacama, Chile. An important property and a considerable producer of copper.

VIVANDIERE MINE.

COLORADO.

Owned and operated by Twin City Development Co.

VOLCANIC COPPER MINING & SMELTING CO.

CALIFORNIA.

Dead. Former office, 256 So. Broadway, Los Angeles, Cal.

VOLCANIC MINING, SMELTING & DEVELOPMENT CO.

BRITISH COLUMBIA.

Out of business. Property not taken over because misrepresented.

VON GERNET COPPER, LTD.

CHILE.

Offices: 38, Billiter Square Bldgs., London, E. C., Eng. Maj. F. I.

Rickarde-Seaver, F. R. S., chairman; D. Mountier, secretary. Registered July 4, 1901, to acquire patents and concessions for extraction and treatment of ores of copper, gold and other metals. Capitalization, £11,000, in 10,000 preference shares of £1 and 10,000 ordinary shares of 2s.; issued, £10,522. Lien, £3,000, registered July, 1903. Has small works at Angostura, Chile, and Brussels, Belgium.

J. D. VORIS COPPER MINING CO.

COLORADO.

Mine office: Hillside, Fremont Co., Colo.

MINAS VUELTA FALSA.

SPAIN.

Office: care of Miguel Yglesias, 2, Tokenhouse Bldgs, London, E. C., Eng. Mine office: Paimago, Huelva, Spain. Group includes the Fronteriza and other mines, near the Chanza river, which separates Spain and Portugal. Property shows a vein of about 20' width, giving good assay values in copper, with about 46% sulphur.

VULCAN CONSOLIDATED COPPER CO.

NEVADA.

Office: 35 Nassau St., New York. Mine office: Siegelton, Esmerelda Co., Nev. Organized 1899, as the Vulcan Copper Mining & Smelting Co., and reorganized 1901, with present title, under laws of West Virginia, with capitalization \$5,000,000, shares \$10 par: issued, \$3,000,000. Chas. F. Champion, president and general manager; Joseph Siegel, first vice-president; Ambrose I. Harrison, secretary and treasurer; Newton A. Duncan, superintendent. Lands, 49 claims, area 980 acres, also 3 millsites, in the Soda-ville or Santa Fé district, developed by about 7,000' of shafts and tunnels, and claimed to show about 60,000 tons of ore assaying 2.7% to 4% copper, with gold and silver values of 75c to \$1 per ton. Has a small smelter, which is idle, and has experimented with a leaching process. Company is a dead-beat.

VULCAN COPPER CO.

OREGON.

Office: San Francisco, Cal. Mine office: Takilma, Josephine Co., Ore. Bought the property of the Mountain View Copper Co., for \$24,000. Equipment includes a 30-ton Vulcan smelter, never blown in. Mine shows a promising vein of bornite. Idle, awaiting construction of a railroad into the Waldo district.

VULCAN COPPER MINING CO.

WYOMING.

Office: Wausau, Wis. Mine office: Encampment, Carbon Co., Wyo. Organized 1898, with capitalization \$1,000,000, shares \$1 par. W. M. Monroe, president; W. D. Kolloch, secretary; F. J. Lordier, superintendent. Lands, 120 acres, in the Encampment and Battle Lake districts. Has 3 shafts, deepest about 100', showing a 15' sulphide ore vein. Idle.

WABASH MINING CO.

CALIFORNIA.

Office: Los Angeles, Cal. Mine office: Letcher, Fresno Co., Cal. Dr. J. H. Bryant, president. Lands, 16 claims, adjoining the Copper King, with two shallow shafts, and tunnels of 300' and 400'. Has steam plant and air compressor. Presumably idle.

WABASH MINING CO.

UTAH.

Mine office: Park City, Summit Co., Utah. G. M. Gillett, superin-

tendent. Ores carry gold, silver, lead and copper. Has steam power and employed about 20 men, at last accounts.

WAGNER-GREEN MINING & MILLING CO.

COLORADO.

Letter returned unclaimed from Pearl, Larimer Co., Colo.

WAHNITA COPPER MINING CO.

MICHIGAN.

Fraudulent. Name changed to Erie Cons. Mining & Reduction Co.

WAHSATCH MINING CO.

UTAH.

Office: 2206 Lincoln Ave., Ogden, Utah. H. C. Baker, president and general manager.

WAIDANI MINE.

JAPAN.

Mine office: Kamine-mura, Taka-gori, Bizen, Japan. Ore is argenterous chalcoppyrite, associated with sphalerite and galena, in two very thin veins. A small producer only.

WALDO COPPER MINES CO.

OREGON.

Correct title is Waldo Smelting & Mining Co.

WALDO SMELTING & MINING CO.

OREGON.

Office: P. O. Box 1487, Colorado Springs, Colo. Mine office: Takilma, Josephine Co., Ore. Organized Dec. 3, 1901, under laws of Colorado, with capitalization \$3,000,000, shares \$100 par. Chas. L. Tutt, president and manager; Spencer Penrose, secretary and treasurer; J. A. Hull, assistant secretary and treasurer; Col. T. Waln-Morgan Draper, superintendent. Lands, 20 patented claims, area 400 acres, with millsite and 650 acres of placer lands, in the Waldo district, showing 5 fissure veins, said to average about 10' width and giving estimated average values of 12% copper and \$3 gold per ton, from sulphide ores. Development is by a shaft and two tunnels, with extensive underground openings. The Copper King shaft, about 200' deep, has an 80' crosscut-drift showing a good ore body. The 700' Lyttle tunnel and the 400' No. 2 tunnel, on the same claim, show fine bodies of ore. The 310' Cowboy tunnel connects with the incline shaft 160' below surface, and is to be extended to intersect known ore bodies. There also has been considerable development secured and a large ore body opened on another property, title to which is in litigation. Property is about 40 miles from the Southern Pacific railroad, but a line has been surveyed through the district. The Takilma smelter, built by practically the same people as own the Waldo, was blown in Sept. 8, 1904, on Waldo ores. The Queen of Bronze mine furnishes heavy sulphide ore, and the Cowboy mine provides oxidized ores for furnace mixtures. Officers of the company are men of the highest standing, with long and successful experience in mining, and the property is regarded as promising.

GEWERKSCHAFT WALDSTOLLN.

GERMANY.

Office: Düsseldorf, Germany. Mine office: Dermbach, Weimar, Germany. Ores mined are spathic iron and a little chalcoppyrite, production of latter having been 60 tons in 1902. Employs 37 men.

WALES COPPER MINING CO.

ALASKA.

Merged, 1904, in Hadley Consolidated Copper Co.

WALL STREET MINE.

NEVADA.

Mine office: Luning, Esmerelda Co., Nev. A. S. Lawrie, superintendent.

**WALLAROO & MOONTA MINING &
SMELTING CO., LTD.****SOUTH AUSTRALIA.**

Offices: Grenfell St., Adelaide, South Australia. Mine offices: Wallaroo, Yorke Peninsula, and Moonta, Yorke Peninsula, South Australia. Employs 2,319 men. D. Davidson, secretary; H. Lipson Hancock, general manager. The Wallaroo mine, discovered 1860, and the Moonta mine, opened circa 1861, both on the Yorke Peninsula, about 10 miles apart, were amalgamated in 1890, under the present title.

The Wallaroo mine, which includes the Kurilla, an adjoining property, employs 1,130 men, or about half of the total force, the balance being employed in the Moonta mines and at the reduction works. Area of the Wallaroo, including the Kurilla, is about 2,000 acres, this property showing 6 practically parallel veins, the main ore body having a nearly vertical dip, with strike of North 75° West, ranging 3' to 25' in width and being opened for a length of 1,800' and a depth of about 2,500'. The Wallaroo and Kurilla have about 30 shafts, with upwards of 30 miles of underground openings. Country rock is metamorphosed mica-schist. The gossan gave a little atacamite and carbonate ores at surface, followed by cuprite and melaconite, but the oxidized ore bodies were worked out many years ago. At depth the ore is mainly chalcopyrite, averaging 2% to 4% copper, as mined, and 11% after dressing. Gangue of the ore is iron pyrites, calcspar and schistose country rock, ores being slightly auriferous and argentiferous. Shafts are mainly inclines on the veins, hoisting with 2-ton and 3-ton skips, principal shafts being Taylor's shaft, 2,070' deep; the Office shaft, 1,920', and Young's shaft, 1,350'. The principal portion of Taylor's shaft was ruined by fire early in 1904, and has been replaced by a new vertical shaft from surface, connecting with the lower levels of the old workings. The Kurilla mine is opened on a lode parallel to the Wallaroo, to a depth of 1,170', the ore body ranging 10' to 12' in width, but being bunchy, with high-grade chutes of ore averaging 11% after hand dressing. Ore in both the Wallaroo and Kurilla is won mainly by overhand stoping. Wide stopes are timbered by wooden pillars, with waste-filling on either side of the drifts.

The area of the Moonta group is 2,673 acres, held on leasehold from the Crown. Country rock is felsite-porphry. The Moonta shows 27 veins, ranging 6" to 20' in width, with 5 practically parallel main veins, having an average strike of North 30° East, with numerous stringers and laterals. Development is by 21 trial shafts and 56 working shafts, many of the latter having been abandoned. Shafts are mostly vertical for a short distance, thence following the dip of the lode, and the mine has upwards of 40 miles of underground openings. Mining is by both overhead and underhand stoping, ores from the Moonta averaging 16% copper after dressing.

The mines have extensive hoisting, pumping and power plants. Having been opened at a period when mining practice was largely different from that of the present time, there are entirely too many shafts for economical working, and the policy of the present management is to reduce the number of shafts, and increase the capacity of those retained. Upon surface there

were a great number of small, isolated machinery plants, and these, as far as possible, are being consolidated and replaced by large and modern plants. A new central steam and power plant at the Wallaroo branch is effecting a very large saving in operating costs. Large and commodious changing houses, with shower-baths and lockers, have been built at the principal shafts, and the company maintains a library and reading-room well supplied with books and periodicals.

The exceptional weight and flakey nature of the gangue renders concentration an exceedingly difficult problem. Large concentrators have been built at both groups of mines, and the process followed at each is essentially the same. The ore is dumped on grizzlies, thence to bins for various sizes, whence drawn off to railway trucks and carried to the concentrators. At the mills, after passing through crushers with water, the material goes to revolving trommels, from which oversize goes to a traveling belt, whence ore is picked by boys, and passed through crushers with water. Ores passing a $\frac{5}{8}$ " mesh are treated on specially designed Hancock jigs, and raggings passing $\frac{7}{8}$ " and $1\frac{1}{4}$ " meshes are treated separately on other specially designed Hancock jigs. Material rougher than $1\frac{1}{4}$ " is hand-picked from the picking belt. The well known Hancock jig, now in use throughout the world, was especially designed by Mr. H. R. Hancock, the former general manager, for the use of these mines. The largest size jigs treat 200 tons of material in 8 hours. About 12% to 15% of the material is slimed, and this goes to spitzkasten for classification and distribution to round tables and vanners, which turn out a 12% product.

The coarse material and fine tailings from the washing machinery are piled in heaps and weathered. These heaps range 20' to 60' in height, the tops of the coarser heaps being laid out in terraces. The heaps are systematically sprinkled, the leach-liquor running to the vats from the heaps carrying 60 to 120 grains of copper to the gallon. These heaps cover about 30 acres and contain upwards of 1,000,000 tons of tailings.

The slimes and fine wastes go to a specially designed leaching plant, and are passed through a series of vats containing leach-liquor, 12 lbs. to 20 lbs. of sulphuric acid being added to the leach-liquor for each ton of slimes treated. The slimes in the vats are agitated by revolving arms, the pulp, after agitation, passing to settling dams and clarifying reservoirs. The leach-liquor is drawn off in earthen pipes to the main precipitating works, where it joins the liquor from the various tailings heaps, and copper is precipitated therefrom by passing over scrap iron. The material from the settling dams is weathered and given a second, and occasionally a third, leaching. The production of cement copper from this plant is 15 tons to 20 tons weekly. In addition to cement copper, the leaching plant makes considerable bluestone, and more or less acid is sold from the acid plant maintained in connection with the works.

The smelter is at Port Wallaroo, 6 miles from Wallaroo and 11 miles from Moonta. In addition to treating the company's ores, considerable custom smelting is done, the product being a blister copper of exceptional

purity. The average annual output of the Wallaroo and Moonta is nearly 15,000,000 lbs. of fine copper, but was only 13,070,952 lbs. in 1904, owing to trouble experienced from the loss of production from Taylor's shaft during the greater part of the year. The mines have produced upwards of \$50,000,000 in values, and for 1903 gross profits were £63,092. The property is well handled, and many improvements are being introduced by the present management.

WALTHAM MINE, LTD.**COLORADO.**

Offices: 155, Fenchurch St., London, E. C., Eng. Mine office: Russell Gulch, Gilpin Co., Colo. Dr. J. H. Gower, managing director; E. T. Coote, secretary. Organized June 16, 1903, with capitalization, £25,000, shares £1 par. Lands include the Waltham mine, carrying gold, silver and copper ores.

WANDILTA COPPER MINES, LTD.**AUSTRALIA.**

Offices: 30, Moorgate St., London, E. C., Eng. Mine office: Kadina, Yorke Peninsula, So. Australia. A. S. Caine, chairman; J. A. Russell, secretary. Lands, 140 acres, including the Wandilta mine, near Wallaroo. Main shaft, 240'. Vein is 2' to 3' wide, with a limited amount of development. Mine presumably idle, and company apparently moribund.

WAPITI MINING CO.**COLORADO.**

Office: 932 Equitable Bldg., Denver, Colo. Mine office: Wapiti, Summit Co., Colo. A. J. White, superintendent. Ores carry gold, silver, lead and copper. Has steam and water power, concentrator and 5' Huntington mill.

WAR EAGLE CONSOLIDATED MINING &**BRITISH COLUMBIA.****DEVELOPMENT CO., LTD.**

Office: 49 Wellington St. Toronto, East, Ont. Mine office: Rossland, Yale district, B. C. Organized January, 1897, under laws of British Columbia, with capitalization \$2,000,000, shares \$1 par; issued, \$1,750,000. Mortgage, \$625,000, at 5%, payable on demand. Paid dividends of \$544,250, June 1898, to February 1900, inclusive; no later dividends. Geo. Gooderham, president; Thos. G. Blackstock, vice-president; E. J. Kingstone, secretary; E. B. Kirby, general manager. Lands include the War Eagle, Richmond, Crown Point and other mines, carrying ores of copper, gold and silver. Ores treated in 1901 averaged about 2.1% copper, \$16 gold and 1 oz. silver per ton, producing about 750,000 lbs. of refined copper that year.

FREDERICK WARDE GOLD & COPPER MINING CO.**NEVADA.**

Office: Salt Lake City, Utah. Organized March 1, 1904, with capitalization \$300,000, shares \$1 par. Frederick Warde, president; Jacob Myers, treasurer; A. W. Raybould, secretary. Lands are in the Yellow Pine district of Lincoln county, Nevada.

WARRA WARRA MINE.**AUSTRALIA.**

Office: care of F. Stevens, Grenfell St., Adelaide, South Australia. Ores are chalcopryrite, chalcocite, cuprite, malachite and native copper, with quartz gangue and clay gouge, in country rocks of clay-slates, sandstone and quartzite in alternating strata. Has two shallow vertical shafts, in ore bodies of fair size. Presumably idle.

WARREN DEVELOPMENT CO.**ARIZONA.**

Office: care of C. D. Hanchette, treasurer, Hancock, Mich. John Funkey, president; J. A. Fuller, secretary. Organized 1903, under laws of Michigan, with capitalization \$100,000, shares \$10 par; issued, \$16,000. Lands, 12 claims, area 200 acres, adjoining the property of the Higgins Development Co., at Bisbee, Cochise county, Arizona. Idle.

WARRIOR COPPER CO.**ARIZONA.**

Proposed title for reorganization, 1905, of Black Warrior Copper Co., Amalgamated.

WARRIOR MINING CO.**COLORADO.**

Office: care of W. F. Hess & Co., 32 Continental Bank Bldg., St. Louis, Mo. Lands, 26 claims and 2 millsites, in Costilla county, Colorado, claimed to show ores assaying up to 12% copper, 20 oz. silver and 2 oz. gold per ton.

WASATCH CONSOLIDATED MINING CO.**UTAH.**

Office: Salt Lake City, Utah. Mine office: Milford, Beaver Co., Utah. Fred O. D. Meakin, president and manager; Wm. Harrison, secretary and treasurer. Organized 1904, with capitalization \$1,000,000, shares \$5 par. Property is the Wasatch King mine, showing a 4' vein of copper ore carrying a 20" paystreak, also a gold vein.

WASHINGTON CO-OPERATIVE MINING SYNDICATE.**WASHINGTON.**

Mine office: Fairfax, Wash. Lands, 2 claims, 17 miles by trail from Fairfax, showing a 25' vein with 3' paystreak carrying disseminated chalcopryite, assaying 5% to 33% copper, 5 oz. to 8 oz. silver and \$2 gold per ton. Has water power available. Was in hands of receiver, until company's coal lands, near Fairfax, were sold to the Western Iron, Coal & Coke Co. Idle.

WASHINGTON COPPER & MILLING CO.**WASHINGTON.**

A swindle, promoted by the notorious L. E. Pike & Co., who are still peddling worthless stock to the credulous public from 17 Milk St., Boston, Mass. These swindlers advertised the mine to be "the richest copper property in the United States, with even more flattering prospects than the Calumet & Hecla or United Verde." The "mine" consisted of a 50' shaft, bottomed in gravel.

WASHINGTON COPPER MINING CO.**MICHIGAN.**

Office: 60 State St., Boston, Mass. Organized under laws of Michigan, with capitalization \$2,500,000, shares \$25 par; issued, \$1,500,000. Annual meeting, fourth Tuesday in March. H. F. Fay, president; Jas. Chynoweth, superintendent; preceding officers, John C. Watson, Stephen R. Dow and Chas. E. Adams, directors; Geo. G. Endicott, secretary and treasurer. Lands 1,050 acres, on the western shore of Mosquito Lake, Keweenaw county, Michigan. Exploratory work was discontinued in spring of 1901, but may be resumed when construction of the Keweenaw Central Railway permits cheaper costs. Company had \$3,932.11 cash on hand, Jan. 1, 1905.

WASHINGTON COPPER MINING & SMELTING CO.

Office: 5 Tremont St., Boston, Mass.

WASHINGTON MINE.**CALIFORNIA.**

In Sections 30, 31 and 32, T. 2 S., R. 15 E., Tuolumne Co., Cal. Owned

by W. E. & G. A. Hensley. Was formerly a considerable producer. Vein formation is diabase and meta-diabase.

WASHINGTON MINERAL MINING & SMELTING CO.

Office: 510 Bernice Blk., Tacoma, Wash.

WASHINGTON SMELTING & REFINING CO.

WASHINGTON.

Works office: Keller, Ferry Co., Wash. Organized 1904, with capitalization \$1,000,000, shares \$5 par, to build a smelter, at West Fork, on the San Poil river, 15 miles south of Republic, to treat the ores of the Belcher Mining Co., and adjoining properties.

WASHINGTON-SONORA GOLD & COPPER CO.

MEXICO.

Office: care of A. Sandoval, treasurer, Nogales, Sonora, Mex. Organized 1902, under laws of Arizona, with capitalization \$2,500,000, shares \$5 par. A. L. Lewis, president; Percy Sharpe, secretary and general manager; A. H. Hoover, superintendent. Lands, 4 pertenencias, area 10 acres, in the Magdalena district of Sonora, Mexico, showing fissure veins and lenses in limestone carrying a little native copper, oxide and carbonate ores, giving estimated values of 18% copper, 12 oz. silver and \$4 gold per ton, slightly developed by shafts and tunnels.

WASHOE COPPER CO.

MONTANA.

Mine office: Butte, Silver Bow Co., Mont. John D. Ryan, managing director; Wm. Skyrme, superintendent; J. B. Gallagher, manager sampling works. Capitalization \$20,000,000, entire stock issue being held by the Amalgamated Copper Co. According to records only \$50 of capital has been paid in. Lands include the Moonlight, Chambers, Clear Grit, Washoe, Pacific, Oden and Gold Hill claims. The Moonlight is the principal producer, having a 3-compartment shaft about 1,400' deep, connected underground with the Blue Jay, Never Sweat, Anaconda and Pacific, with a 20x48" Dickson hoist and two Ingersoll-Sergeant air-compressors of 50 drills aggregate capacity. The Clear Grit is in litigation with the Heinze interests. The Chambers has a 200' shaft only, and the other claims are but partially developed. Ores give about the same average returns as those of the Anaconda. Production for the year ending June 1, 1903, was 106,588 tons of ore, giving a gross yield of \$10.45 per ton. Mining costs were \$3.75 and smelting costs \$3.08 per ton. Production of refined copper was about 8,000,000 lbs. for the calendar year 1903. Properties now are worked by the Anaconda under lease, hence the Washoe is credited with no production in 1904.

The sampling works of Taylor & Brunton Ore Co. were bought, 1904, by the Washoe. The gigantic Washoe reduction works, title of which stands in name of the Washoe Copper Co., are described in the article on Anaconda. The principal object of the Washoe seems to be to serve as a leech on the Anaconda. All of the Washoe stock is owned by the Amalgamated Copper Co., while only a majority interest in the Anaconda is held by the Amalgamated, hence the application of the leech.

WASHOUGAL GOLD & COPPER MINING CO.

WASHINGTON.

Office: 5312 Maple Ave., St. Louis, Mo Mine office: Washougal, Clarke Co., Wash. F. A. Mabee, president; J. D. Wilcox, vice-president; James

B. Jordan, secretary; Dr. Otta Sutter, treasurer; A. D. Wright, superintendent; Oria Wright, mine superintendent. Organized 1902, under laws of South Dakota, with capitalization \$1,000,000, shares \$1 par. Lands, 280 acres, in the St. Helens district, showing several fissure veins in granite, of which 2 are being developed, one opened by a 405' tunnel, with a 50' drift, showing a vein of undetermined width carrying ore assaying 4% to 20% copper, 15% lead, 15% zinc, 2 oz. silver and \$1 to \$8 gold per ton. Has bunk-house, smithy, etc., and plans extending tunnel, sinking a shaft and installing machinery during 1905. Company is out of debt, and seems to be developing along sound lines.

**WAUKEGAN & WASHINGTON MINING
& SMELTING CO.**

WASHINGTON.

Mine office: Bossburg, Stevens Co., Wash. James Moffatt, superintendent. Ores carry gold, silver and copper. Has steam power.

WAYEHUTTA MINE.

NORTH CAROLINA.

Owned and operated by Carolina Copper Co.

WEILERTHALER BERGWERKE G. m. b. H.

GERMANY.

Mine office: Markirch, Elsass, Germany. Dr. Recht, president; Jakob Siebensschuh, superintendent. Capitalization, 1,400,000 marks. Is a producer of ores carrying silver, copper and antimony, ore being mainly tetrahedrite. Employs about 150 men.

C. WEISS y CA.

PERU.

Office and mine: Nuevo Canete, Peru. Firm is a small producer from ores carrying gold, silver and copper.

WELCOME GOLD MINING CO.

COLORADO.

Mine office: Puzzler, Colo. Geo. L. Spence, superintendent. Operates the Silent Friend mine. Ores carry gold, silver and copper. Has steam power.

WELDON GOLD & COPPER CO.

ARIZONA.

Office: Tucson, Ariz. Mine office: Quijotoa, Pima Co., Ariz. Organized Jan. 26, 1901, under laws of Arizona, with capitalization \$2,500,000, shares \$1 par. Peter White, president; Jas. A. Green, vice-president; Ferris S. Fitch, secretary, treasurer and general manager; J. W. Giddings, superintendent; Fred Wall, mine superintendent; J. B. Tomlinson, engineer. Lands, 17 claims, area 340 acres, also a 10-acre millsite, in the Quijotoa district. Property shows sundry contact veins between granite and andesite-porphry, of which 5, averaging 12' to 35' width, are partially developed, these showing oxide and carbonate ores at surface and chalcoppyrite at depth, latter being auriferous and associated with sphalerite, galena and iron pyrites, with brecciated quartz gangue, giving average assays up to 22% copper. Openings include 5 shafts, deepest 200', and 7 tunnels, 5 of which are cross-cuts, longest being an 1,800' crosscut tunnel, with total underground openings of about 3,000'. Has a 15-h. p. gasoline hoist and 4 power drills, with carpenter shop, machine shop, smithy, boarding-house, powder-house, assay office, store and 75x100' mill with 20 stamps, of 100 tons daily capacity. Property is 65 miles from the Southern Pacific railroad. Management

plans sinking main shaft to depth of 500' and opening levels every 50'. Officers of company are men of high standing.

WELSH COPPER MINING SYNDICATE, LTD.**WALES.**

Offices: 9, Fenchurch Ave., London, E. C., Eng. Mine office, Talybont, R. S. O., Cardiganshire, Wales. Organized Apr. 9, 1902, with capitalization £17,500, shares £1 par; issued, £17,207. J. Bell-Irving, chairman; R. S. Corbett, managing director; W. H. Bartlett, secretary; James Stevens, consulting engineer. Lands, 933 acres, including the Esgair Hir mine, carrying argentiferous sulphide ores of copper and lead, in two fissure veins of 40' average width, stated by company to average 3% to 10% copper, 4% to 5% lead, and 13 oz. silver per ton, opened by shafts of 150' and 500'. Has a 40-ton concentrator. Idle, owing to lack of working capital.

WENDIGO COPPER CO., LTD.**MICHIGAN.**

Title changed, July, 1901, to Isle Royale Land Corporation, Ltd.

WENTWORTH MINE.**ARIZONA.**

Mine office: Payson, Gila Co., Ariz. J. G. Wentworth, superintendent.

WERDENHOFF MINING & MILLING CO.**IDAHO.**

Office: care of Hon. F. W. Hunt, president, Boise, Idaho; Stephen A. Powell, secretary; Horace E. Neal, treasurer. Capitalization, \$5,000,000. Lands, 11 claims in the Big Creek district of Idaho county, showing a mineral formation of about 250' width, carrying mainly gold values, with a little lead and copper.

WEST AUSTRALIAN MINING CO., LTD.**AUSTRALIA.**

Reorganized as African & Australian Co., Ltd.

WEST CHILLAGOE MINES.**AUSTRALIA.**

Sundry claims in the Chillagoe district of Queensland, Australia. Idle.

WEST FORK GOLD-COPPER MINING CO.**IDAHO.**

A rank fraud, promoted by the notorious L. E. Pike & Co., who still are permitted by an indulgent government to conduct their swindling operations through the United States mails.

WEST GROUP.**BRITISH COLUMBIA.**

Mine office: Yreka, Vancouver Island, B. C. Adjoins the Yreka mine.

WESTMORELAND COPPER CO.**NEW BRUNSWICK.**

Office: Dorchester, N. B. Said to have 7,000' of underground openings, with concentrator, smelter and 80 percipitating tanks for copper leaching. Company claims to have expended \$250,000 on mines and plant.

WEST MOUNTAIN MINING COMPANY, OF ARIZONA.**UTAH.**

Office: 48 Main St., Nashua, N. H. Capitalization \$1,000,000, shares \$1 par. Wm. H. Child, president; J. E. Dearborn, secretary. Organized under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. Lands, 7 claims, adjoining the Red Wing and Red Wing Extension, in the Bingham district, Salt Lake county, Utah, slightly prospected by several short tunnels that have cut no ore. Idle.

WEST QUINCY MINING CO.**UTAH.**

Office: Atlas Blk., Salt Lake City, Utah. Mine office: Park City, Summit Co., Utah. Organized, 1904, under laws of Utah, with capitalization

\$1,500,000, shares \$5 par. G. D. B. Turner, president; H. A. Miller, secretary. Property is a three-eighths interest in the J. I. C. mine, with an option on the remaining interest. The J. I. C. mine, lands 5 claims, is developed by a 600' vertical two-compartment shaft with about 3,000' of underground openings. It is expected that the main ore body will be struck at a depth of 750 and that the Daly-West contact vein will be cut at about the 900' level.

WEST ST. DAVID'S GOLD & COPPER MINES, LTD. WALES.

Offices: 156, Leadenhall St., London, E. C., Eng. Capital, £7.

WEST SIDE MINING CO. WASHINGTON.

Letters returned unclaimed from former office and former officers.

WEST SLOPE MINING & MILLING CO. UTAH.

Letter returned unclaimed from former office, 627 Mining Exchange, Denver, Colo., and former mine office, La Sal, Grand Co., Utah. Gid. R. Popper, manager. Lands, 240 acres, slightly developed, showing a 4' vein of auriferous and argentiferous copper ore. Probably bankrupt.

WESTERN MINING CO. COLORADO.

Office: 71 Broadway, New York. Mine office: Lake City, Hinsdale Co., Colo. Saml. D. Nicholson, general manager; N. A. Nicholson, superintendent. Operates the Ute and Ulay mines, producing lead, copper, gold and silver. Has water, steam and electric power, with 200-ton concentrator and employs about 100 men.

WESTERN MINING CO. MONTANA.

Office: Butte, Mont. Mine office: Apex, Beaverhead Co., Mont. Employs 64 men. Thos. F. Stephens, president, treasurer and general manager; T. Ellis, secretary; G. A. Heberlein, superintendent. Lands, one patented claim, known as the Indian Queen mine, also a 3-acre millsite, in the Utopia district. Country rocks are granite, dolomite and quartzite, showing 2 contact veins, between granite and limestone, averaging 8' to 10' width, developed by shafts of 150' to 220' and an 820' tunnel, with 1,600' of underground openings, estimated to show 50,000 tons of ore with 10,000 tons blocked out for stoping. Property shows nearly every commercial ore of copper except enargite, ores being mainly chalcocite and chalcopyrite, giving average returns of about 9% copper, 4.5 oz. silver and 40c. gold per ton. Was discovered 1867, and has been worked since, intermittently, by leasers. Has steam and gasoline power, with a smelter, connected by tramway with the shafts. Smelter has a 30-ton 36" circular water-jacket blast-furnace, making matte averaging 55% copper, 27 oz. silver and 0.13 oz. gold per ton, sent to the Butte & Boston smelter at Butte for refining. Was making 60 to 75 tons of matte monthly, during latter part of 1904. Nearest railroad is the Oregon Short Line, 7 miles distant. Average costs per ton are \$4 for mining and \$4.20 for smelting. Production for 1903 was about 700 short tons of refined copper. Property said to have been taken over, under a \$125,000 bond and lease, by the Amalgamated Copper Co., on Dec. 8, 1904.

WESTERN SLOPE COPPER MINING & SMELTING CO. COLORADO.

Office: 38 Ames Bldg., Boston, Mass. Mine office: Grand Junction, Mesa Co., Colo. Employs 8 men. Organized July 25, 1900, under laws of

Colorado, with capitalization \$750,000, shares \$1 par. Henry H. Marden, president; J. H. McCurdy, treasurer; James V. Howard, secretary; W. C. McCurdy, general manager; Wm. Lynch, superintendent. Lands, 14 claims, area about 290 acres. Principal development is on the Nancy Hanks claim, with a 250' shaft and 135' of drifts, from which 17 cars of ore shipped to smelter gave returns of 11% to 18% copper. Company claims to have blocked out over 5,000 tons of ore, which is a remarkable achievement with only 135' of drifts. Company paid regular quarterly dividends of one-half per cent while peddling stock, and may be set down as a questionable proposition.

WETTERHORN LAND CO.**MICHIGAN.**

Office: Ontonagon, Mich. Organized under laws of California. Lands, 760 acres, in Sections 21 and 22, Town 51 North, Range 42 West, Ontonagon county, Michigan. Was sinking a shaft, 60' deep at end of 1904, on an amygdaloid carrying some copper, both coarse and fine, with a little barrel copper on the hanging wall.

WEYMAN & YOUNG.**ALASKA.**

Office and mine: Coppermount, Alaska. E. E. Weyman, superintendent. Lands, sundry claims, showing auriferous and argentiferous copper ores. Property has water power.

WHALE MINE.**NEW MEXICO.**

Mine office: Tres Piedras, Taos Co., N. M. Wm. A. Royal, superintendent.

WHALEN COPPER MINING CO.**NEVADA.**

Apparently hopelessly insolvent.

WHAT CHEER COPPER MINING CO.**WYOMING.**

Letter returned unclaimed from Riverside, Carbon Co., Wyo.

WHEALKATE MINING CO.**MICHIGAN.**

Office and mine: Houghton, Houghton Co., Mich. Organized November, 1902, under laws of Michigan, with capitalization \$50,000, shares \$25 par. Nathan F. Leopold, president; R. R. Goodell, vice-president; Reginald C. Pryor, secretary; Albert F. Leopold, treasurer. Lands, 240 acres, including the old Wheal Kate property, on which a little misdirected mining was done many years ago. Is primarily a land and townsite company, but owns mineral lands in Section 17 which apparently should carry workable values on the southern extension of the Isle Royale amygdaloid, which is proving rich in the Section 11 shaft of the Isle Royale mine.

WHIM WELL COPPER MINES, LTD.**AUSTRALIA.**

Offices: 11, Ironmonger Lane, London, E. C., Eng. L. Downs, secretary. Capitalization £150,000; issued, £100,007. Lands, 260 acres, in the Pilbarra Goldfield, Western Australia.

WHIPSAW COPPER CO.**ARIZONA.**

Office: 35 Wall St., New York. Mine office: Prescott, Yavapai Co., Ariz. W. T. Pickerell, agent. Idle.

WHITE BEAR MINE.**BRITISH COLUMBIA.**

Mine office. Rossland, Yale district, B. C. Mine is about 1,000' deep, and made first production, 300 tons, in 1903, and shipped about 2,000 tons

of ore in 1904. Has a 150-h. p. Jenckes electric hoist, and 30-drill compound Rand air-compressor, driven by a 300-h. p. electric motor. Mill has 30 gravity stamps, with double-discharge mortars, 6 Wilfley concentrating tables and a 4-unit Elmore oil concentrator. Ore is a friable chalcopyrite carrying gold and silver values, and alimes very easily. Elmore plant said to be giving satisfaction, but mine's tonnage evidently is too small to permit an economical test.

WHITE EAGLE COPPER MINING CO.

TEXAS.

Bankrupt. Lands sold to pay debts.

WHITE HORSE MINING CO.

ARIZONA.

Office: 20 Broad St., New York. Lands, 200 acres, in Yavapai county, Arizona. Company is trying to sell stock to secure funds for resumption of work.

WHITE KNOB COPPER CO., LTD.

IDAHO.

Office: 36 Wall St., New York. Mine office: Mackay, Custer Co., Idaho. Was organized originally, under laws of West Virginia, as the White Knob Mining Co., with capitalization \$5,000,000; reorganized, with present title, April 24, 1900, under laws of New Jersey, with capitalization \$12,500,000, shares \$100 par; again reorganized, January, 1903, under same charter and title, with capitalization \$2,000,000; capitalization increased 1904, to \$2,600,000, shares \$10 par. Debentures, \$500,000 of 6% 10-year sinking-fund gold bonds, due 1913. On March 2, 1904, authorized an issue of \$1,000,000 first-mortgage 10-year, 6% sinking-fund convertible gold bonds. Went into hands of receivers late in 1904, and now plans reorganization by organizing a new company with \$6,000,000 capitalization, shares \$10 par, in 200,000 7% cumulative preference and 400,000 common shares, giving bondholders new stock at par, and a bonus of 233% in common stock. Harry J. Luce, president; Wilbur K. Matthews, vice-president; Chas. G. Funk, secretary; Chas. B. Van Nostrand, treasurer; N. H. Clark, general manager; N. H. Clark and W. K. Matthews, receivers; W. H. Cox, mine superintendent; J. Audley Smith, smelter superintendent.

Lands, 32 claims, 3 millsites, the 90-acre townsite of Mackay, sundry timber lands, water rights and right-of-way for an electric line, all in the Lost River Valley, with an area of about 2 100 acres. The main shaft is 700' deep, connecting with the Albert tunnel, about 1,500' long. Property is claimed to show a 23' vein, carrying 3% to 9% copper and \$1.75 to \$3 gold and silver, having about 6 miles of underground openings, with considerable reserves of ore developed for stoping. The mine has a good machinery plant, including hoists, a 10-drill air-compressor and a 3-drill auxiliary compressor. Mine is reached by a 96-mile branch of the Oregon Short Line railway, running from Blackfoot to Houston. Mine is connected with smelter by a 10-mile electric railway having a maximum gradient of 6%, in a rise of 2,000'.

The smelter has three 200-ton furnaces, and was blown in September, 1902, but blown out after a month's run. One stack was blown in again October 5, 1903, the smelter also treating custom ores of the Pocatello Gold & Copper Co., these making a desirable flux. Trouble seems to have been

had with the smelter, for reasons not apparent. In November, 1903, the smelter was said to be handling 300 to 500 tons of ore daily, making therefrom about 15,000 lbs. of copper, 800 oz. silver and 20 oz. gold, which would indicate a return of 1.5% to 2.5% copper only, with gold and silver values of \$1.60 to \$2.60 per ton. Production for 1904 is estimated at 1,250,000 lbs. fine copper. Operations were resumed, February, 1905, with about 40 men, and it was planned at that time to start the smelter in the following spring.

The policy of the White Knob has been consistent in one thing only, that being the utter inconsistency of its management. Mine officials have been changed repeatedly, reorganization has followed reorganization, stock has been increased, decreased and bonds issued, authorized and redeemed. The smelter has been blown in, blown out and blown in until the wonder grows that full-grown men should cut such antics. For a chicken-headed management the White Knob takes first prize in the booby race. Whether the mine is valuable or worthless may be determined when it is run as a mine, and not as a kindergarten.

WHITE PINE COPPER CO.**NEVADA.**

Office: 79 Nevada Blk., San Francisco, Cal. Mine office: Ruth, White Pine Co., Nev. Capitalization \$500,000. J. R. Phillips, Jr., president; S. D. Olney, secretary; M. L. Requa, general manager; E. F. Gray, superintendent. Lands, sundry claims, including the Ruth group, held under \$150,000 bond and lease, also the Lost Hope and Columbia groups. The Ruth group has a 500' main shaft, showing large bodies of medium-grade auriferous copper ores. Buildings include engine-house, office, boarding-house, stable, and 6 dwellings, and company is said to plan erection of a reduction plant, to include both concentrator and smelter.

WHITE PINE GROUP.**MONTANA.**

Office and mine: care of Steuwe, Schmidt & Co., Helena, Lewis & Clark Co., Mont. A 16" vein carrying ores assaying \$86 per ton in gold, silver and copper, has been opened by a 220' tunnel and 250' crosscut.

WHITE PINE MINE.**MICHIGAN.**

Office: care of R. R. Goodell, agent, Houghton, Mich. Lands, 80 acres, in the Porcupine Mountains, owned by St. Mary's Mineral Land Co., having a 170' shaft and 4 shallow pits, all bottomed in a continuation of the lode of the Nonesuch mine. Never a producer, and idle many years.

WHITE ROCK COPPER MINING CO.**CALIFORNIA.**

Office: Ellsworth, Me. Mine office: Lewis, Mariposa Co., Cal. Chas. C. Burrill, president. Lands, 30 acres, patented, showing heavy gossan outcrops, with schistose diabase vein-matter 100' wide. Ore is sulphide at depth of 100 feet. Main shaft, 150', with 950' of underground openings. Smelter shipments of 450 tons of oxide and carbonate ores, shipped 1902, gave average returns of 20% copper and \$2 to \$4 gold and silver per ton.

WHITE TANKS MINING CO.**ARIZONA.**

Office: care of Henry E. Bomberger, general manager, Phoenix, Ariz. Is a Philadelphia corporation, owning sundry claims carrying gold and copper in the White Tanks Mountains, circa 40 miles west of Phoenix. Said also to have bought a smelter at Wickenburg, Maricopa county, Arizona.

WHITNEY REDUCTION CO.**NORTH CAROLINA.**

Mine office: Gold Hill, Rowan Co., N. C. Lands adjoin the Union mine.

WICKENBURG SMELTING & REDUCTION CO.**ARIZONA.**

Dead.

WICKES-CORBIN COPPER MINING CO.**MONTANA.**

Office: 19 East Broadway, Butte, Mont. Mine office: Corbin, Jefferson Co., Mont. Capitalization \$1,000,000, shares \$1 par. Succeeded the Colorado Mining & Development Co. Lands include the Hidden Treasure and Copper Queen mines, carrying auriferous and argentiferous copper ores.

WILLIE BOY MINE.**OREGON.**

Mine office: Comer, Grant Co., Ore. J. Reese, superintendent.

WILMOT MINING CO.**MICHIGAN.**

Office: Ontonagon, Mich. W. H. Garlick, president. Lands, mineral rights to 3,520 acres in Ontonagon county. Company has done no mining.

WINDFALL MINING CO.**WASHINGTON.**

Mine office: Chewelah, Stevens Co., Wash. C. T. Rigg, superintendent. Said to have ores carrying gold, silver, lead and copper.

WINNEBAGO MINING CO.**COLORADO.**

Mine office: Central City, Gilpin Co., Colo. Ores carry gold, silver and copper. Has steam power and employed 10 men at last accounts.

WINNIPEG MINES, LTD.**BRITISH COLUMBIA.**

Office and mines: Phoenix, B. C. John Dean, president; Richard Flewman, secretary, treasurer and general manager. Has auriferous and argentiferous copper ores, with steam power and air-compressor. Company practically bankrupt at last accounts.

WINONA COPPER CO.**MICHIGAN.**

Office: 15 William St., New York. Mine office: Winona, Houghton Co., Mich. Employs about 100 men. Organized 1898, under laws of Michigan, with capitalization \$2,500,000, shares \$25 par; \$10 paid in. Annual meeting, last Tuesday in March. Boston Safe Deposit & Trust Co., registrar; American Loan & Trust Co., of Boston, transfer agent. John Stanton, president; John R. Stanton, treasurer; preceding officers, Joseph E. Gay, Wm. A. Paine and Jas. H. Seager, directors; J. Wheeler Hardley, secretary; F. W. Denton, agent; J. O. Peterson, mining captain; Wm. Van Orden, clerk.

Official returns to the state of Michigan, as of date Jan. 1, 1904, disclose the following figures:

Amount cash paid in on capital stock.....	\$1,000,000.00
Amount paid in by conveyance of property to company..	450,000.00
Entire amount invested in real estate.....	479,972.50
Amount of personal estate.....	110,378.18
Amount of unsecured or floating debt.....	16,889.98

For calendar year 1904 receipts were \$91,613.63, of which \$87,698.72 was from copper produced, and expenditures were \$155,987.54, leaving a net surplus, Dec. 31, 1904, of \$29,114.29. An assessment of \$1 per share has been levied, payable February, 1905.

Lands, 1,568 acres, in a main tract of 1,440 acres and a smaller tract of 128 acres, main tract being in Sections 19, 20, 29 and 36, T. 52 N., R. 36 W., also timber rights to 1,768 acres lying 3 to 5 miles south of the mine. The main tract carries the outcrop of the Winona amygdaloid bed for upwards of one mile, and for neighbors has the Wyandot on the east and undeveloped lands of St. Mary's Mineral Land Co. on the north, south and west. The mine was discovered, 1864, by a line of prehistoric pits along the outcrop, and a single shallow shaft was then sunk, but owing to entire lack of transportation facilities, little work was done. The property was let on tribute in 1880, but did not furnish sufficient mass copper to pay, and was closed until taken over by the present company, April, 1898, when the old shaft was cut down, retimbered and deepened and 3 new shafts sunk on the Winona lode, an amygdaloid bed running 12' to 46' wide, with a strike of N. 59° E., and a dip of about 70°. Considerable diamond drilling has been done, and several other cupriferous lodes located, but none except the Winona carry copper in promising quantities. The Winona amygdaloid resembles the Baltic lode in some respects, and also bears considerable resemblance to the Knowlton lode of the Evergreen belt. The amygdaloid carries considerable epidote, calcite and quartz, with a limited amount of mass and barrel copper, but the bulk of the metal is found as stamp-copper, the rock being quite uniform in copper contents, though low in grade.

No. 1, the discovery shaft, is in the N. E. $\frac{1}{4}$ of the N. E. $\frac{1}{4}$ of Section 29, T. 52 N., R. 36 W., and is 8x18' inside of timbers, with three compartments and is 400' deep, with 4 levels opened, showing a little heavy copper and some stamp rock in the northern drifts. Idle.

No. 2, the main shaft, 650' deep, is 900' northeast of No. 1, sunk on an angle of 72° and 600' deep, with 6 levels opened and a seventh opening. Considerable drifting has been done on the three lower levels, with much the best showing on the 6th or bottom level. The lode is wider and the formation more regular at the bottom than at any point above. Diamond drill holes bored from the bottom of the shaft in 1904 gave encouraging cores.

No. 3 shaft, 1,650' south of No. 2, was started in May, 1903, and was 450' deep at the end of 1904. There is room for one more shaft at the north and another shaft south of the three already opened.

Old No. 3 shaft, now idle, 900' north of No. 2 and about 750' deep, shows little ground of promise. No. 4, the northernmost shaft, is about 1,350' northeast of No. 1 and also is idle, having found nothing of importance. No. 5 shaft was started on a wide amygdaloid bed, located by diamond drill, but as sinking did not develop good ground, was discontinued at slight depth.

The Winona has upwards of three miles of underground openings. The mine gave a very good showing at and near surface, but this changed at slight depth, when the formation became disturbed, but as the ground becomes settled the appearance of the mine improves greatly. The best showing is toward the southern boundary, and on the fourth level good copper ground is shown for a stretch of about 2,000'.

The engine house, located midway between shafts 1 and 2, is 40x40', of steel frame on stone foundations, with corrugated iron siding and roof. The old double-drum hoist having reached the limit of its usefulness, new and larger hoists were installed during 1904. This building contains an Ingersoll-Sergeant "Class A" two-stage straight-line 12-drill air-compressor, also a smaller single-stage compressor. Adjoining is a boiler house, 40x48', of steel on stone foundations, with iron siding and roof, housing four 80-h. p. boilers. Other mine buildings are a 34x48' combination engine and boiler-house, 26x40' warehouse, 20x40' carpenter shop, 22x34' smithy, 30x40' store building, office building, two boarding-houses, 16 frame dwellings and 9 log houses, the dwellings being built in a townsite platted by the company. The Winona also has a sawmill 30x70', with a 42x66' wing for boilers, and a 16x46' wing containing a shingle mill, the plant having a daily capacity of 20,000' of sawed lumber. The main line of the Copper Range railroad passes near the mine and a spur has been built to No. 2 shaft.

Production was begun, with one leased stamp at the Atlantic mill, in December, 1902, and continued for nearly two years. This work was in the nature of an extensive stampmill test, although the Winona made 1,036,944 lbs., fine copper in 1903, and 646,025 lbs., fine copper in 1904. The results indicate that the property has the making of a mine, the returns being 18.95 lbs. fine copper per ton stamped, in 1904. Milling was discontinued about Nov. 1, 1904, and all energies bent toward opening the mine. Both shafts are being sunk and extensive drifting is under way. The management is of the best and the prospects are that the Winona may make a successful mine.

WINONA GOLD-COPPER MINING CO.

WYOMING.

Office: 417 Kittredge Bldg., Denver, Colo. Organized under laws of Wyoming, with capitalization \$5,000,000, shares \$1 par. James R. Saville, president and treasurer; Henry F. Tower, secretary. Lands, 23 claims, area 475 acres, in the Sunlight district of Big Horn county, Wyoming, showing numerous veins of 8' to 30' width giving assays of 15% to 52% copper, 11 oz. to 15 oz. silver and about \$1 gold, per ton. Property is well timbered and has a good water power available. Idle at last accounts.

WINONA-REX COPPER MINING CO.

WYOMING.

Office: care of John Ludwig, president, Winona, Minn. Mine office: Encampment, Carbon Co., Wyo.

WINTHROP MINE.

MICHIGAN.

Office: Care of L. C. Palmer, owner, Marquette, Mich. Lands, 800 acres, are in Sections, 22, 23, 26 and 27, 58-31, Keweenaw county, Michigan. Mining was done on a fissure vein, 1852-1860, owners expending \$90,000.

WIRRAPOWIE MINE.

AUSTRALIA.

Mine office: Leigh's Creek, South Australia. W. H. Williams, superintendent. Has steam power and employed about 25 men at last accounts.

WISCONSIN CLAIM.

CALIFORNIA.

Office and mine: care of Chas. Richardson, owner, Darwin, Inyo Co., Cal.

Has a contact vein between limestone and granite, 2' to 6' wide, with shaft of about 150', showing cuprite, malachite, and chalcopyrite.

WISCONSIN & ARIZONA MINING CO.**ARIZONA.**

Office and mine: care of M. H. Ryan, president; Prescott, Yavapai Co., Ariz. Organized December, 1904, under laws of Arizona, with capitalization \$1,000,000, shares \$1 par. J. L. Jacquot, vice-president; E. G. Jones, secretary; Dr. Donald McIntyre, treasurer. Lands, 5 claims, known as the Copper King group, in vicinity of Prescott. Has 2 shafts of 35' and one of 50', showing rich auriferous and argentiferous copper ores.

WISCONSIN-WYOMING COPPER MINING CO.**WYOMING.**

Office: care of Wm. Ott, president, La Crosse, Wis. Mine office: Encampment, Carbon Co., Wyo. Organized 1902, under laws of Wyoming, with capitalization \$1,000,000, shares \$1 par. R. B. Gelatt, vice-president; W. E. Polleys, treasurer; John M. Vrchota, secretary and general manager. Lands, 10 claims, in 2 groups, one of 7 claims lying south of the Indianapolis and north of the Beulah, and one of 3 claims lying about one-half mile east of the Hidden Treasure.

WISSAHICKON GOLD-COPPER CO.

Organized, 1902, in Delaware, with capitalization \$1,000,000.

WISSENER BERGWERKE UND- HÜTTEN**GERMANY.****AKTIEN-GESELLSCHAFT.**

Office: Köln, Germany. Mine office: Wissen-am-Sieg, Rheinprovinz, Germany. Capitalization, 8,000,000 marks. Employs 1,100 men, and is an extensive producer of iron ore, 1902 output having been 109,483 metric tons of spathic iron ore and 1,092 metric tons of ore of 10% copper tenor.

WOLVERINE COPPER MINING CO.**MICHIGAN.**

Office: 15 William St., New York. Mine office: Kearsarge, Houghton Co., Mich. Employs about 500 men. Organized 1890, under laws of Michigan, with capitalization \$1,500,000, shares \$25 par. Fiscal year ends June 30. Annual meeting, first Monday in August. Adams Trust Co., registrar; American Loan & Trust Co., of Boston, transfer agent. John Stanton, president; Jos. E. Gay, vice-president; John R. Stanton, secretary and treasurer; preceding officers, J. Wheeler Hardley and Samuel L. Smith, directors; Fred Smith, superintendent; Willard J. Smith, assistant superintendent; Chas. L. Noetzel, clerk; Wm. Pollard, mining captain; B. S. Shearer, mill superintendent; F. Wm. Hartmann, engineer; A. B. Holtenhoff, master mechanic.

Official returns to the state of Michigan, as of date Jan. 1, 1904, disclose the following figures:

Amount cash paid in on capital stock	\$780,000.00
Amount paid in by conveyance of property to company	550,000.00
Entire amount invested in real estate	720,665.23
Amount of personal estate	630,004.89
Amount of unsecured or floating debt	76,346.33

The following table gives comparative figures for the three fiscal years ending June 30:

	1902.	1903.	1904.
Mineral production, pounds	6,232,800	11,330,370	12,152,590
Copper production, pounds	4,984,367	8,260,386	9,300,695
Gross proceeds	\$658,602	\$1,030,755	\$1,192,425
Expenditures at mine.....	364,093	451,740	495,655
Smelting and miscellaneous.....	60,236	97,183	105,033
Construction account.....	264,678	38,014	34,496
Net mining profit.....	—30,405	443,818	591,736
Interest received	6,731	2,505	6,679
Total net profit.....	—23,674	446,323	557,240
Dividends	240,000	270,000	390,000
Balance	—263,674	+176,323	+167,240
Rock hoisted, tons	213,650	299,922	328,412
Rock stamped, tons.....	187,482	279,011	314,091
Yield of rock treated per ton, lbs.	26.590	29.600	29.610
Cost per ton of rock hoisted.....	\$ 1.700	\$ 1.510	\$ 1.510
Cost of rock stamped per ton....	.940	\$ 1.620	\$ 1.580
Cost per pound of refined copper at mine, cents	7.304	5.469	5.329
Cost of smelting and miscellaneous, cents.....	1.208	1.176	1.129
Total cost of refined copper, including construction, per pound, cents	13.820	7.105	6.869

The mine was opened in 1882, by local capital, but was not successful, and the company was reorganized, with the present title and management, in 1890, when new machinery was secured and work resumed. The previous ill success of the mine rendered investors dubious of its future, and cash absolutely necessary for its development was secured with difficulty. Lack of funds imperatively demanded for the operation of the property was met by Mr. John Stanton with a heavy loan, advanced from his own pocket, at a time when other shareholders were unwilling to raise a dollar, and it is due to Mr. Stanton's courage that the Wolverine now is, in proportion to its size, the most profitable copper mine in the Lake Superior district. Under Mr. Stanton's management milling was immediately discontinued, and was not resumed until 18 months of underground development had given adequate reserves of stamp-rock. By reason of the sagacious policy pursued, the mine began making small profits from the time that stamping was resumed, in 1892, and since has enjoyed a steady growth in productive capacity and earning power.

Lands, 280 acres owned in fee, and 40 acres of adjoining mineral rights, giving 3,100' of the outcrop of the Kearsarge amygdaloid bed, on which the mine is opened. The neighbors of the Wolverine are the North Kearsarge on the north, Mayflower on the east, Mayflower and South Kearsarge on the

south and Centennial on the west. The lode averages about 16' width, with an average dip of 41°, and is bunchy, but carries the best average values of any amygdaloid mine in the Lake Superior district.

The Wolverine has 4 shafts, numbered from north to south. No. 1, near the North Kearsarge line, was exhausted and abandoned long ago. No. 2, used solely for hoisting and lowering men, timber and tools, is 1,700' deep and will not be deepened. No. 3, is 2,700' deep, and an important producer. No. 4, is 2,300' deep. Lying about 80' west of and parallel with the Kearsarge bed is the West lode, opened by a crosscut on the 11th level. A little work was done on the West lode in 1903, and one excellent stope was opened, but the prospects of making a paying mine on this bed are not especially bright, as it would be contrary to all precedent were two parallel beds to be found payable so closely together. The mine is developed for 5 to 6 years ahead of stoping requirements, and new openings are being made at the rate of about 600' monthly. Only about one quarter of the power drills employed are used in opening work, balance being employed in stoping, which speaks for the uniform values of the mine.

The two operating shafts can be sunk to depths of about 4,000' each, before reaching the boundary, and the mine can produce at the present rate of about 10,000,000 lbs., fine copper yearly, for 25 to 30 years, before exhausted, each level furnishing about one year's rock supply. A crosscut sent west a quarter mile from the 13th level in 1904 reached the Kearsarge conglomerate, which was found barren, though that bed carries some copper on the Almeek and Seneca tracts to the southward.

Surface equipment is well adapted to present and future requirements, the principal buildings being at No. 4 shaft. The boiler-house, at this point has 3 Stirling water-tube boilers, equipped with American automatic stoker, and a Green fuel economizer. The Rand air-compressors are of 20-drill and 22-drill capacity. No. 3 shaft has a model changing house, much appreciated by the miners. Hoists have straight drums and duplex cylinders. The shafthouses are substantial and equipped with necessary crushing machinery. The company owns a large number of good dwellings and the mine location is exceptionally neat and prosperous in appearance.

Rock is taken to the mill over the Mohawk & Traverse Bay railroad, with a down-grade haul of 13 miles. The mill, put in commission 1902, is near the mouth of the Tobacco river, on Traverse Bay, Lake Superior, and adjoins the Mohawk mill, both being served by a single pump and managed by a joint superintendent, this arrangement allowing considerable operating economies. The mill is of steel, on stone foundations, 180x206' in size, standing 37' above lake level, thus giving a good drop for tailings, with ample room to waste the sands. There are 2 Nordberg heads, striking about 110 blows per minute, with a capacity of better than 500 tons daily each. The mill has a full complement of jigs and makes extensive use of Wilfey tables. The boiler-house, standing 16' south of the mill, is 42x58', with stone walls and steel truss roof, housing a battery of 200-h. p. Stirling water-tube boilers fitted with automatic stokers. Coal goes through a

lump-crusher, thence to hoppers having 24 hours' storage capacity. The mill also has a completely appointed machine shop. A 20,000,000-gallon horizontal triple-expansion Snow pump, owned and operated jointly by the Wolverine and Mohawk, has steam cylinders of 18", 33" and 54" diameter, and 22" water plungers with 36" stroke. The pump-house is located on the river, near its mouth, thus avoiding the difficulties encountered elsewhere in securing water from the lake, the intake pipe being protected by timber cribs running 300' into the lake to prevent clogging from floating bark and anchor ice. The coal and merchandise wharf, owned jointly by the mines, is near the mill, and fitted with coal-hoists. A 40-acre townsite, platted near the mills, is named Gay, in deserved honor of Jos. E. Gay, who has been long and honorably identified with Lake Superior copper mining.

Wolverine mineral is smelted by the Calumet & Hecla. This arrangement, made temporarily, may be continued permanently, the Calumet & Hecla works having secured much better returns than were obtained previously, the mineral now giving average net returns of about 82% fine copper, an average of about 31 lbs. fine copper per ton of rock stamped, while only 5% of the rock hoisted is discarded. The mineral was yielding about 76% fine copper only, before smelting was begun by the Calumet & Hecla. The Wolverine is proving an exception to the general rule of decreased values at considerable depths, as its rock is materially richer at 2,000' than at 1,000' depth.

Dividends, which are paid semi-annually, have been increasing steadily for some years, and were \$7.50 per share in 1904, while the first dividend for 1905 was at the rate of \$5 per share. The property is managed, both physically and financially, in a manner beyond criticism.

WOLVERINE MINE.

COLORADO.

Owned and operated by Coldwater Copper Mining Co.

WOLVERINE MINING CO.

UTAH.

Office: Superior Savings Bank Bldg., Hancock, Mich. Mine office: Park City, Summit Co., Utah. Capitalization, \$150,000, shares \$1 par. Chas. A. Wright, president; Martin L. Effinger, vice-president; Lewis A. Jeffs, managing director; H. B. Williams, superintendent. Lands, 11 claims, area circa 125 acres, about half a mile south of the Daly Judge, in the Snake Creek district, developed by tunnel, with about one mile of underground openings, showing 6 veins of 1' to 6' width, carrying auriferous and argentiferous sulphide ores of lead and copper, averaging \$8 to \$10 per ton, mine-run, with occasional antimonial silver, assaying as high as 564 oz. per ton, and with considerable shipping ore, carrying values from \$50 up to \$80 per ton. Working tunnel has cut 2 ore bodies, one a 2' vein carrying 4% copper, 4% lead and 80 oz. silver per ton.

WOLVERINE MINING & LEASING CO.

COLORADO.

Office: care of Dr. Z. L. Baldwin, president, Niles, Mich. Mine office: Pearl, Larimer Co., Colo. Burr T. Lobdell, treasurer and chairman of executive committee. Is a development company, composed of shareholders of the Coldwater Copper Mining Co., which is operating the Coldwater copper mine under a three to five year lease.

WOLVERINE & ARIZONA DEVELOPMENT CO.**ARIZONA.**

Reorganized, 1904, as Wolverine & Arizona Mining Co.

WOLVERINE & ARIZONA MINING CO.**ARIZONA.**

Office: Calumet, Mich. Mine office: Bisbee, Cochise Co., Ariz. Organized, 1904, under laws of Arizona, with capitalization \$3,000,000, shares \$15 par; issued, 96,654 shares. John Daniell, president; Paul P. Roehm, vice-president; W. Frank James, treasurer; F. C. Fenner, managing director; preceding officers, W. H. Brophy, Fred Braastad, Thos. Maslin, Edw. Ulseth, B. F. Chynoweth and Arthur E. Delf, directors; W. R. Oates, secretary; Edwin J. Collins, superintendent; W. H. Roberts, clerk.

Lands, 9 claims, area about 160 acres, claims being known as the Cairo, Memphis, Kentucky, Georgia, Louisiana, Chicago, Warren, George and Broken Promise. The Georgia claim lies about 600' from the lands of the Calumet & Arizona, and about 3,000' from the Irish Mag shaft of the Calumet & Arizona and the Spray and Holbrook shafts of the Copper Queen, three of the richest shafts in the Warren district. The Uncle Sam and White Tail Deer mines of the Copper Queen are adjacent to the Wolverine & Arizona holdings, and leasers are taking rich ore from the White Tail Deer about 800' from the Wolverine shaft. The 700' shaft has 3 compartments, each 5'x4'6" and well timbered, cutting a limestone formation showing considerable iron. The shaft has proven very wet at depth, and has No. 7 and No. 9 Cameron sinking pumps and a 500-gallon Prescott station pump. A drift on the 500' level runs 850' toward the Pittsburg & Duluth, cutting leached ore and ledge matter carrying traces of copper. Surface equipment includes a 280-h. p. steam plant, 2 single-drum hoists, a 6-drill air-compressor, 25x50' engine-house, office, bunk-house, boarding-house and a 10,000-gallon water tank, water being pumped from Naco, 8 miles distant. A large stock of timber and other supplies is carried. The final bond payments do not fall due until Jan. 31, 1907, and most of the payments due on bonds have been taken in stock. The Wolverine & Arizona lands are decidedly promising, and the property may make a mine.

WOOD RIVER GOLD & COPPER CO.

Incorporated 1902, under laws of Delaware, with capitalization \$1,000,000, by W. W. Watson, et al, of Scranton, Pa.

WORLD'S FAIR MINE.**ARIZONA.**

Office and mine: care of Frank Powers, owner, Nogales, Santa Cruz Co., Ariz. Mine, in the Patagonia district has shipped a little high-grade cupriferous silver-lead ore to El Paso smelters.

WRIGHT & LAWRENCE MINING CO.**CALIFORNIA.**

Office: 709 Stewart Bldg., Chicago, Ill. Eric Forsell, president; A. W. Linqvist, general manager. Lands, 16 claims, area 320 acres, in Riverside county, California. A rotten stock-jobbing concern.

WRIGHT-RUSSELL COPPER MINING CO.**WYOMING.**

Mine office: Battle, Carbon Co., Wyo. W. J. Russell, manager. Said to show auriferous copper ore.

WYACCA MINE.**AUSTRALIA.**

Office: care of E. Pearce, Broken Hill Chambers, Adelaide, South Aus-

tralia. Lands are in the Hundred of Basedow, in the Flinders range, 8 miles southwest of the Blinman mine, and about 260 miles north of Adelaide. Vein ranges 1" to 26" wide, carrying cuprite, melaconite and chalcopyrite, in a gangue of calcspar and spathic iron.

WYANDOT COPPER CO.**MICHIGAN.**

Office: 24 Congress St., Boston, Mass. Mine office: Winona, Houghton Co., Mich. Organized 1899, under laws of Michigan, with capitalization \$2,500,000, shares \$25 par, \$9 paid in. Old Colony Trust Co., of Boston, registrar. Annual meeting, first day of May. Henry Stackpole, president; Irving J. Sturgis, vice-president; Wm. O. Gay, secretary and treasurer; preceding officers, Jos. Dorr and Matthew Van Orden directors; Frank L. Van Orden, superintendent; Thos. Buzzo, mining captain.

Lands, 1,040 acres, adjoining the Winona mine, in Sections 16, 20 and 21, T. 52 N., R. 36 W., Houghton county, Michigan. Tract is crossed by the Copper Range railroad. Surface improvements include machine and blacksmith shops, warehouse, barns, and about 12 dwellings, with boilers, hoists, shop machinery and tools.

Exploratory work was begun February, 1899, and has been continued uninterruptedly. The overburden is very heavy, greatly impeding both shaft-sinking and diamond-drilling. Early work was performed in search of the Winona lode, while efforts were made later to locate the southern extension of the Baltic amygdaloid, but attention was again turned to the Winona lode. No. 1 shaft, 261' deep, is on an amygdaloid supposed to be the Winona, having a parallel underlying amygdaloid bed 60' distant, both being broken and of poor promise, though showing occasional patches of well-mineralized ground. Owing to the favorable developments in the Winona mine, sinking in No. 1 was resumed in September, 1904. Shaft No. 11, about a quarter-mile from No. 1, and 100' deep, shows a disturbed and unsatisfactory formation, with parallel amygdaloids 50' apart, these giving occasional bunches of good ground, but not payable at the depth gained. A 102' shaft also has been sunk on a lean cupriferous conglomerate underlying the Winona bed, and a 300' shaft sunk on an amygdaloid identified as the Elm River gave no promising ground. A crosscut was sent eastward, in 1904, to the Eastern Sandstone, and also several hundred feet westward, cutting several amygdaloids carrying copper in small quantities, on which a little drifting was done, but nothing of promise found. It is thought that the Baltic lode was one of the amygdaloids located in the western crosscut, but the lode in question was very wide and void of copper. Crosscutting was discontinued in September, 1904, and work transferred to the Winona shaft and to the banks of the Misery river, in Section 16, Town 52 North, Range 36 West, where a 20' amygdaloid was found outcropping in the bed of the river. This lode carries considerable epidote, calcite and quartz, with copper disseminated throughout in fine grains. The Wyandot owns the southern half of Section 16 and holds an option on the northern half. In addition to sinking, drifting and crosscutting, much diamond-drill boring has been done. The company is managed prudently, and while results to

date have not been of an especially encouraging nature, the management plans to continue work until the property has been thoroughly tested.

WYOMING CONSOLIDATED COPPER CO.

WYOMING.

Office: 27 State St., Boston, Mass. Letters returned unclaimed from Encampment and Collins, Wyoming.

WYOMING COPPER & GOLD MINING CO.

WYOMING.

Office: Alma, Kansas. C. B. Henderson, manager.

WYOMING MINING CO.

WYOMING.

Mine office: Kirwin, Big Horn Co., Wyo. Titus Sheord, president; B. F. Brown, secretary; C. A. Tewksbury, superintendent. Ores carry copper, silver and gold values. Employs 15 to 20 men.

WYOMING QUEEN MINING CO.

WYOMING.

Office: Laramie, Wyo. Mine office: Jelm, Albany Co., Wyo. Employs 3 men. Organized January, 1902, under laws of Wyoming, with capitalization \$1,000,000, shares \$1 par; issued, \$740,000. Louis Miller, president and general manager; L. A. Hancock, secretary. Lands, 18 claims, area 350 acres, also 20 acres miscellaneous lands, in the Jelm Mountain district, showing 3 fissure veins carrying auriferous and argentiferous oxide, carbonate and sulphide copper ores and galena, all of good assay values. Has two 100' shafts and tunnels of 70' and 250', with about 600' of underground openings. Has a 6-h. p. gasoline hoist and several small buildings.

WYOMING & ALABAMA MINING CO.

WYOMING.

Letter returned unclaimed from former mine office, Tie Siding, Wyo.

WYOMING & COLORADO COPPER CO.

COLORADO & WYOMING.

Said to have lands in the Douglas Mountains, 125 miles south of Rock Springs, Wyoming.

WYONA IRON & COPPER CO.

WYOMING.

Office: 928 Equitable Bldg., Denver, Colo. Mine office: Battle, Carbon Co., Wyo. Capitalization \$2,000,000, shares \$1 par. Geo. E. Ross-Lewin, president; H. A. McIntyre, secretary and treasurer. Lands, 16,380 acres, in 4 groups, in Wyoming, carrying iron and copper ores, coal, and indications of oil.

COMPANIA MINERA YABRICOYA.

CHILE.

Mine office: Iquique, Tarapacá, Chile. Operates the Aguada copper-silver mine, in the vicinity of Iquique.

YACO GROUP.

BRITISH COLUMBIA.

Sundry claims near Lynn Creek, Vancouver Island, B. C., said to be bonded to a Boston syndicate. Ore is chalcopryite, associated with iron pyrites and pyrrhotite, assaying about \$4 gold per ton, with small silver values.

YADKIN CONSOLIDATED MINING CO.

NORTH CAROLINA.

Organized 1903, under laws of North Carolina, with capitalization \$1,000,000, to develop copper properties in that state.

YADKIN MINING & IMPROVEMENT CO.

NORTH CAROLINA.

Office: 508 Herman Bldg., Milwaukee, Wis. Lands are in Yadkin county, North Carolina.

YADKIN & VIRGILINA COPPER & LAND CO. NORTH CAROLINA.

Organized 1903, under laws of North Carolina, with capitalization \$750,000, to develop copper properties.

YAEGER CAÑON COPPER CO. ARIZONA.

Office: Union Trust Bldg., Detroit, Mich. Mine office: Prescott, Yavapai Co., Ariz. Employs 20 men. Organized Apr. 11, 1903, under laws of Arizona, with capitalization \$800,000, shares \$1 par. Robt. E. Plumb, president; Richard E. Sloan, vice-president and general manager; Geo. B. Russell, secretary; Geo. H. Russell, treasurer; C. E. Brinker, superintendent. Lands, 21 claims, area 460 acres, in the Black Hills district. Formation is diorite and slate, showing three principal ore bodies, occurring as fissures in diorite, of which one, averaging 14' width, is developed by shafts of 350' and 860' with about 2,350' of underground openings, estimated to give 40,000 tons of ore in sight, with about 25,000 tons blocked out for stoping, ore being bornite and chalcopryite, averaging 6% copper, 8 oz. silver and \$2 gold per ton. Property has a 240-h. p. steam plant, with a 140-h. p. hoist good for depth of 3,500', a 10-drill Sullivan air-compressor, and a 60-ton concentrator, 30x104', of wood and iron, with No. 2 Austin centrifugal crusher, 2 trains of rolls and 5 Wilfley and Bartlett tables. Property is regarded as promising. Production for 1904 was 4,000 tons of ore averaging 6.5% copper.

YALE GOLD-COPPER MINING CO. BRITISH COLUMBIA.

Moribund. Had property at Rossland B. C., circa 1896.

YAMATE MINE. JAPAN.

Mine office: Takigawa-mura, Kume-gori, Mimasaka, Japan. A very old property. Ore is slightly argentiferous chalcopryite, associated with iron pyrites, galena and sphalerite, with arenaceous clay gangue, occurring in quartz-diorite. Best grade of ore yields 10% to 13% copper. Production in 1899 was 3,044 momme of silver and 99,679 lbs., refined copper.

YAMPA SMELTING CO.

Organized 1903, with capitalization \$100,000, as a subsidiary corporation of the Tintic Mining & Development Co., to build a smelter for the Yampa mine of that company. Geo. H. Robinson, general manager; Jas. W. Neill, superintendent. See Tintic Mining & Development Co.

YANCEY MINE. NORTH CAROLINA.

An old and idle mine in Person county, North Carolina, main vein ranging 6' to 14' wide and showing gray copper ore carrying 1 oz. to 7 oz. silver and about \$2 gold per ton.

YANKEE CONSOLIDATED MINING, MILLING & TUNNELING CO. COLORADO.

Mine office: Yankee, Clear Creek Co., Colo. Henry I. Seeman, manager. Operates the Lombard, Polaris and other mines, producing gold, silver, copper and lead. Has steam power and 5-stamp mill.

YANKEE MINING CO. UTAH.

Mine office: Eureka, Juab Co., Utah. Ores carry gold, silver, lead and copper. Has steam power and employed about 20 men at last accounts.

YAQUI COPPER CO.**MEXICO.**

Office: 170 Broadway, New York. Mexican general office: Hermosillo, Sonora, Mex. Mine office: Suaqui de Batuc, Sonora, Mexico. Capitalization \$5,000,000, shares \$10 par. Wm. Sauntry, president; Geo. E. Green, secretary and treasurer; John M. Thurston, vice-president and general counsel; R. B. Brown, general manager; W. E. Pomeroy, superintendent; Frank Davis, smelter superintendent; Gen. Henry Ide Willey, consulting engineer.

Lands, 6,032 acres, also 119,284 acres of timber and grazing lands, and water rights to 25 miles of the Yaqui river, mining lands being in the neighborhood of Suaqui de Batuc, Campo Santo Niño, Sonora, Mexico, in the Sierra Madre mountains, about 120 miles from Hermosillo. The property shows antiguas, supposed to have been worked by the Aztecs, as there are no records of their operation under Spanish rule. The tract is well watered and well timbered, except in the more mountainous portions. In addition to gold, silver and copper, the tract carries iron ore, apparently of good grade, and indications of coal.

A contact vein between granite and limestone is estimated by the company to be 80' to 800' in width, and several miles in length, with one exposure of one-quarter mile depth of the vein on the face of a mountain, these figures being ridiculously excessive. The main ore body is crossed by a smaller vein, at nearly right angles. Oxidized ores are shown in the upper portions, with solid sulphides below, ores noted being cuprite, melaconite, malachite, azurite, chalcocite, bornite and chalcopyrite. Average assays of a large number of samples gave 14.92% copper, 6.6 oz. silver and 2.09 oz. gold per ton.

Development, begun 1901, is by 2 shafts and 8 tunnels, the ore standing well and requiring little timbering. Improvements include engine and boiler-houses, office building and a store. Adjoining the mines are two villages, one inhabited by Mexican workmen and the other by Yaqui Indians. The property is about 75 miles from a railroad. Company plans installation of a 1,000-h. p. plant on the Yaqui river, and transmission of power to Campo Santo Niño, also plans the erection of a large concentrator on the Yaqui river, 3 miles from the mine and 4,000' lower, transporting ores by gravity or aerial tram. Property shows low-grade ferruginous copper ores and limestone suitable for fluxing. Is said to have a 250-ton smelter in blast, which probably is an error. The outrageous misrepresentations made regarding this property by the promoters deserve the severest censure. The chief promoter, a former resident of Arizona, presumably is enjoying an even warmer climate, being dead. General Willey will have some stiff explaining to do to clear his skirts. Sauntry is a lumberman, who knew nothing of mining, but will know more when he is done with the Yaqui.

YAQUI SMELTING & REFINING CO.**NEW MEXICO.**

Works office: San Antonio de la Huerta, Sonora, Mex. F. Davis, general manager; Victor A. Lucier, superintendent. At last accounts was building a 125-ton smelter, 80 miles east of Torres and 60 miles below Campo Santo Niño. Plant, furnished by the Allis-Chalmers Co., was specially designed to reconcentrate, smelt and refine ores of silver, lead and copper. Equipment includes a two-story ore sampler, machine shop, electric light

plant and ice plant. Is the first and only custom smelter in Sonora, and, being surrounded by a wonderfully rich mineral district, should earn good profits and assist greatly in the development of the resources of the state.

YAQUI RIVER LAND & DEVELOPMENT CO., LTD. **MEXICO.**

Offices: 4, Bank Bldgs., London, E. C., Eng. T. Morriss, secretary. Capitalization, £40,000. Lands, 87,000 acres, near Guaymas, Sonora, Mexico.

SOCIEDAD YAURICOCHA LIMITADA. **PERU.**

Office and mine: Huaripampa, Yauyos, Perú. Is a small producer of argentiferous copper ores.

YAVAPAI COPPER CO. **ARIZONA.**

Office: 317 Main St., Springfield, Mass. Mine office: Prescott, Yavapai Co., Ariz. Geo. Nightingale, president; Frederick Carpenter, secretary. Capitalization \$1,000,000, shares \$10 par. Lands, 25 claims, area 516 acres, about midway between Jerome and Prescott. Idle.

YAVAPAI DEVELOPMENT CO. **ARIZONA.**

Office: Calumet, Mich. Organized, 1904, with capitalization \$400,000.

NEGOCIACION MINERA DE CLEMENTE YBARRA. **MEXICO.**

Mine office: Promontorios, Sonora, Mexico. Don Clemente Ybarra, owner; Jesus Maria Quijada, manager. Property includes the Almada y Terito, Alvarado and Gloria mines, carrying gold, silver and copper ores, developed by shafts and tunnels. Employs 40 to 50 men.

YELTA MINE. **AUSTRALIA.**

Sold to Paramatta Copper Mines, Ltd.

YENISEI COPPER CO., LTD. **SIBERIA.**

Offices: 65, Gracechurch St., London, E. C., Eng. Mine office: Abakansk, Yenisei, Siberia. Organized Apr. 21, 1902, with capitalization £300,000, shares £1 par; issued, £191,007. Debentures, £3,365. T. E. Hurst-Hodgson, chairman; J. D. Kendall, consulting engineer; E. L. Edmonds, mine manager; P. J. Brenchley, secretary. Lands include mineral leases of 8,500 acres and timber rights over 470,000 acres, in the province of Yenisei, Siberia. Is opening two mines, which are said to average 5% copper, and contemplates erection of a smelting plant. The Julia mine is said to show reserves of 42,000 tons of 5% ore.

YORK HARBOUR COPPER CO., LTD. **NEWFOUNDLAND.**

Wound up. Lands sold to Humber Cons. Mining & Mfg. Co.

YOSEMITE COPPER MINING & REDUCTION CO. **CALIFORNIA.**

Office: 214 Potomac Bldg., Los Angeles, Cal. Mine office: Daulton, Madera Co., Cal. J. M. Hambleton, president; I. N. Richards, secretary; C. Van Timmons, superintendent. Has 4 parallel veins, carrying auriferous and argentiferous copper ores, opened by an 80' shaft. Has steam power.

YREKA COPPER CO. **BRITISH COLUMBIA.**

Office: 515 Fidelity Bldg., Tacoma, Wash. Mine office: Yreka, Vancouver Island, B. C. Organized 1901, under laws of Washington, with capitalization \$2,000,000, shares \$1 par. C. W. Riddell, president; C. D. Lynn, vice-president; S. T. Lewis, secretary and general manager; N. S. Clarke, general superintendent; W. C. Spicer, treasurer. Lands, 16 patented

claims, on Comstock Mountain, Quatsino Sound, Vancouver Island, including the Comstock and Superior groups, also 3 unpatented claims in the Victoria district, 2 miles from tidewater, on the eastern side of the island, this latter group, known as the Yreka, being idle. The Superior group has an enormous contact vein, said to show a 200' outcrop. Development is by open-cut and 3 tunnels, disclosing a large body of auriferous and argentiferous sulphide ore, estimated by company to carry average values of 7% copper, 2 oz. silver and \$3 gold per ton. Amount of ore in sight is variously estimated at 2,000,000 to 4,000,000 tons, with perhaps 500,000 tons available for stoping, which undoubtedly is an over-estimate. The mine has a 10-drill air-compressor, with direct-connected Pelton wheel. A 3,600' Riblet aerial tram, of 600 tons daily capacity, leads to a fine wharf having a 2,500-ton ore-bunker. There also are two smaller aerial trams, of 400' and 800' length. The company contracted to ship 100,000 tons of ore to the Crofton smelter, on the strength of which contract the smelter people advanced considerable sums, and mined about 2,500 tons, 1903-04. Property idle at last accounts. Management considered honest and property promising, but company's finances in very unpromising condition.

YTTERØEN MINE.**NORWAY.**

A Norwegian mine that shipped 1,300 tons of cupriferous pyrites in 1900.

YUDA COPPER CO., LTD.**AUSTRALIA.**

Company did not go to allotment.

SYNDICAT DU YUNNAN.**CHINA.**

Offices: 404, Salisbury House, London, E. C., Eng., and 32, Rue Louis Le Grande, Paris, France. Achille Adam, president; G. T. Frost, secretary in London; G. de Marousem, secretary in Paris; Consul-general E. Rocher, agent in China. Organized Oct. 17, 1899, as the Anglo-Foreign Syndicate, name changed, 1900, to present title, with capitalization £35 000, in 34,875 £1 ordinary shares and 2,500 deferred 1s. shares. Has a government concession, for 85 years, to exploit mineral deposits and incidentally build railways, canals, etc., in 7 districts of the province of Yunnan, China, on a royalty of 35% to the Chinese government, payable after deduction of 28% of net earnings for interest, sinking fund, and reserve.

YUSPENSSKI MINE.**SIBERIA.**

The Spassky Copper Mine, Ltd., was organized, 1904, in England, to take over this mine and its allied smelter. The Yuspensski mine is located approximately 500 miles south of Petropavlovsk, Siberia, which is the nearest railroad point, and is the principal copper producer of the Kirghiz Steppes. Property shows a network of veins, occurring near contact of slate and acid igneous rocks, ore being mainly bornite, with gangue of quartz and barite, but showing frequent chalcocite and tetrahedrite, with occasional malachite, azurite, cuprite, and native copper. Property has been worked in a small way since circa 1865, development being by an open-cut, once 150' deep, but since caved in, and by vertical shafts sunk in the footwall, crosscuts being driven to the veins. Main shaft is 257' deep, showing a vein of 17'

average width, carrying about 15% copper. As the services of engineer, assayer and metallurgist are dispensed with, the development and operation of the mine are along exceedingly crude lines. Timbering costs an average of \$1.25 per ton of ore mined, owing to poor management. Timbers are insecurely placed and subject to frequent crushes, after which new timbers are installed inside of the old, with the result of eventually reducing the mine openings to impassible dimensions. The smelter, known as the Spasski Works, is 70 miles from the mine, and ore is hauled thereto in carts, so much ore being lost in transit that the track of the ore-carts is emblazoned by a purple train of bornite, visible for several miles distance. The ore is heap-roasted with coal, the process requiring 3 weeks, and as the roast-heaps are located on the top of a hill, where furious winds prevail, there is much cintering and heavy losses. The smelter has 6 rectangular brick furnaces, of 2½ tons daily capacity each. So poor is the metallurgical practice that a smelter charge of 15 tons of ore requires 54 tons of fuel and flux for its reduction. The matte is run onto the casting floor, which is of sand, with many pools of water which cause alarming explosions. About half of the matte is removed by tapping and the balance dug out by hand. Slags run about 3% copper and are fed back into the furnace repeatedly, until gradually worn out. The eventual product, however, is a 99.5% blister copper, of excellent quality. Wages are about 20c. per day for miners, and 500 men, women and children are employed about the mines and works.

**ZAMBESIA EXPLORING
CO., LTD.**

**RHODESIA & PORTUGUESE
EAST AFRICA.**

Offices: 30, Clements Lane, London, E. C., Eng. Organized March 26, 1891, with capitalization, £40,000, since increased to £300,000, shares £1 par. Tyndall White, chairman; Robert Williams, managing director; J. R. Farrell, consulting engineer; L. Scotland, secretary. Lands, sundry mining claims in Rhodesia, including copper claims in the Lomogunda district, 60,000 acres of farm lands, and extensive share interests in various South African and East African mining and industrial corporations.

COMPANHIA DA ZAMBEZIA.

PORTUGUESE EAST AFRICA.

Offices: 53, Rua do Alecrim, Lisbon, Portugal and 10, Rue Lafayette, Paris, France. Organized May 20, 1892, under Portuguese royal decree, with capitalization 2,700 contos do reis, shares 4,500 reis (£1) par; issued, 2,025 contos do reis. Property is a concession of 60,000 square miles, on either side of the Zambesi and Shire rivers, extending east of latter to the coast, and embracing the ports of Quelimane and Chinde, Portuguese East Africa. Concession includes copper-bearing fields of prospective value.

COMPANIA MINERA ZAPOTECA.

MEXICO.

Office: Laclede Bldg., St. Louis, Mo. Mine office: Ocotlán, Oaxaca, Mexico. Organized January, 1903, under laws of West Virginia, with capitalization \$1,000,000, shares \$1 par. Geo. T. Riddle, president; P. R. Flitcraft, secretary; Frank A. Vickery, resident director; Guillermo W. Thompson, general superintendent; F. J. Tayman, assistant superintendent. Lands, 33 pertenencias, area 81 acres, also 420 acres of miscellaneous lands, in the

Taviche district, including the Zapote mine, carrying auriferous copper and silver-lead ores, developed by a 400' main shaft and a 300' tunnel. Has steam power, with a 30-h. p. Webster, Camp & Lane double-drum hoist good for depth of 1,000'. Nearest railroad is the Ferrocarril Oaxaca y Ejutla, 8 miles distant. Work of active development was begun in 1903, and is being pushed vigorously, with a force of about 125 men.

ZARAGOZA COPPER & ZINC MINES, LTD.**SPAIN.**

Offices: 19, Queen Victoria St., London, E. C., Eng. A. H. Greenhill, secretary. Organized Nov. 14, 1900, as Sarragoza Zinc mines, Ltd.; name changed to present title, January, 1901, with capitalization £60,000, shares £1 par; issued, £9. Was formed to adopt an agreement with the Rio Tenido Copper Mines, Ltd., but agreement was not effected.

COMPAÑIA MINERA ZAUCUDO.**COLOMBIA.**

Mine office: Medellin, Antioquia, Colombia. Juan de la Posado, superintendent. Operates the Zaucudo and Savalotas mines, producing gold, silver and copper. Has steam power and smelter, employing several hundred men.

ZELLER ERZBERGWERKE GES. m. b. H.**GERMANY.**

Mine office: Altlay bei Zell am Mosel, Rheinprovinz, Germany. Robert Reiser, president. Employs 100 men and produces cupriferous silver-lead ores.

ZENITH GOLD & COPPER MINING CO.**WYOMING.**

Mine office: Encampment, Carbon Co., Wyo. Organized, 1904, to develop claims on Purgatory Gulch, near the mines of El Rey Gold & Copper Mining Co.

ZOMEKI MINE.**JAPAN.**

Mine office: Ikuno-mura, Abu-gori, Nagato, Japan. Ores are slightly argentiferous chalcopyrite and bornite, associated with sphalerite, galena and pyrrhotite, occurring as lenses and fissure veins, near liparite dikes penetrating clay-slate, sandstone and limestone.

ZONIA COPPER MINING CO.**ARIZONA.**

Office: 218 Tremont St., Boston, Mass. Letter returned unclaimed from former mine office, Prescott, Yavapai county, Arizona.

CHAPTER XVI.

GENERAL COPPER STATISTICS.

While more compact than in the earlier issues of this work, the present chapter of statistics will be found to contain more matter, and in somewhat better arrangement, as numerous tables have been consolidated, this work being carried, in some instances, so far as to put three and four into one, which is considered fair concentrating practice. As a consequence of this process of consolidation, many of the tables will be found to give information upon two to a dozen points each.

All tables are fully indexed and cross-referenced in the index of the entire book following this chapter, but the following condensed table of contents may be found to facilitate reference:

WORLD'S COPPER PRODUCTION: By Countries, For Nineteenth Century, By Largest Mines, By Various Mines, Estimate for 1904—pages 843 to 851.

AMERICAN COPPER PRODUCTION: By States—pages 851 to 853.

LAKE SUPERIOR COPPER PRODUCTION: By Mines, Production and Value, pages 853 to 855.

AMERICAN EXPORTS: Exports, By Ports, By Destinations—pages 855 to 856.

AMERICAN IMPORTS:—page 857.

COPPER TRADE OF THE WORLD: Detailed Tables by Countries—pages 858 to 862.

PRICES AND VALUES: Sundry Tables—pages 863 to 867.

DIVIDENDS, ASSESSMENTS AND GENERAL FINANCES: Prices and Sales of Listed American Shares, Dividends of American Mines, Dividends of Lake Superior Mines, Dividends and Assessments of Lake Mines, Capitalization of Lake Copper Companies—pages 868 to 876.

SUNDRY LOCAL STATISTICS: Forces Employed by Michigan and Montana Mines, Number of shareholders in Lake Copper Companies—page 877.

FUTURE PRODUCTION OF COPPER: Sundry Tables based upon Production of the Nineteenth Century—pages 878 to 879.

WORLD'S COPPER PRODUCTION BY COUNTRIES.

Country.	(Long Tons.)					
	1890.	1896.	1898.	1900.	1901.	1902.
Algeria.....	120	.....	.....	.....	.....	.....
Argentina.....	150	100	125	775	780	240
Australasia.....	7,500	11,000	18,000	23,000	30,875	28,640
Austria.....	1,210	1,075	1,110	865	1,015	1,015
Bolivia.....	1,900	2,000	2,050	2,100	2,000	2,000
Canada.....	3,050	4,000	8,040	8,500	18,800	17,485
Chile.....	26,120	23,500	24,850	25,700	30,000	28,930
Cape Colony....	6,450	7,450	7,060	6,720	6,400	4,450
Great Britain...	935	555	640	650	600	600
Germany.....	17,625	20,065	20,085	20,410	21,720	21,605
Hungary.....	300	210	430	490	320	485
Italy.....	2,200	3,400	2,965	2,955	3,000	3,370
Japan.....	15,000	21,000	25,175	27,840	27,475	29,775
Mexico.....	4,325	11,150	16,435	22,050	23,795	35,785
Newfoundland...	1,735	1,800	2,100	1,900	2,000	2,000
Norway.....	1,390	2,500	3,615	3,935	3,375	4,565
Peru.....	150	740	3,040	8,220	9,520	7,580
Russia.....	4,800	5,100	6,260	8,000	8,000	8,000
Sweden.....	830	500	480	450	450	455
Spain & Portugal.	51,700	53,325	52,375	52,872	53,621	49,790
United States....	115,966	205,384	235,050	269,111	268,522	294,297
Turkey.....	.....	.....	470	520	980	1,100
Venezuela.....	5,640	.....	.....	.....	.....	.....
Totals.....	269,096	374,854	430,405	486,363	513,243	542,167

WORLD'S COPPER PRODUCTION.

Year.	(Long Tons.)			Percentage of U. S. Production.
	United States.	Foreign.	Total.	
1880.....	27,000	126,959	153,959	17
1881.....	32,000	131,000	163,000	19
1882.....	40,467	141,155	181,622	22
1883.....	51,574	147,832	199,406	24
1884.....	64,708	155,141	220,249	29
1885.....	74,052	151,540	225,592	32
1886.....	70,430	146,656	217,086	32
1887.....	81,017	142,781	223,798	36
1888.....	101,054	156,972	258,026	39
1889.....	101,239	159,966	261,205	38
1890.....	115,966	153,489	269,455	43
1891.....	126,839	152,552	279,391	45
1892.....	154,018	156,454	310,472	49
1893.....	147,033	156,497	303,530	48
1894.....	158,120	166,385	324,505	49
1895.....	169,917	164,648	334,565	50
1896.....	205,384	167,079	373,363	54
1897.....	220,571	178,384	398,955	54
1898.....	235,050	194,106	429,156	54
1899.....	253,870	215,440	469,310	54
1900.....	269,111	216,743	485,854	57
1901.....	268,522	242,497	511,019	53
1902.....	294,297	247,870	542,167	54

PRODUCTION OF WORLD'S LARGEST MINES.

Year.	(Pounds.)					
	Calumet & Hecla.	Anaconda.	Rio Tinto.	Boston & Montana.	Mansfield.	Copper Queen.
1867..	1,315,173					
1868..	5,098,375					
1869..	12,315,771					
1870..	14,031,584					
1871..	16,222,590					
1872..	16,162,183					
1873..	18,848,265					
1874..	20,125,225					
1875..	21,473,954					
1876..	21,690,732		11,731,708			
1877..	23,568,468		41,057,139			
1878..	25,253,128		54,245,564			
1879..	26,270,943		50,228,595			
1880..	31,675,239		58,775,915			1,379,940
1881..	31,360,781		61,171,913			3,866,581
1882..	32,053,528		38,951,360		25,795,840	7,744,278
1883..	33,125,045		45,857,280		28,310,320	7,523,981
1884..	40,473,585		48,303,360		28,183,680	7,668,617
1885..	47,247,990		52,604,160		27,888,000	6,663,782
1886..	50,518,220		55,328,000		28,212,800	3,797,256
1887..	46,016,123		63,840,000		29,176,000	5,707,728
1888..	50,295,721		63,840,000		29,970,200	12,031,614
1889..	48,668,296		66,080,000		34,733,440	12,152,910
1890..	59,868,106		67,200,000		35,392,000	13,120,934
1891..	63,586,620		71,680,000		30,920,000	13,022,957
1892..	56,495,211		70,560,000		34,406,400	12,916,416
1893..	60,427,913		69,664,000		31,696,000	13,795,618
1894..	61,324,626	95,578,000	73,920,000	50,000,000	33,677,600	12,968,372
1895..	79,137,399	99,775,294	75,040,000	55,000,000	33,286,400	16,235,723
1896..	89,280,621	125,350,693	73,920,000	60,250,000	40,913,600	22,966,169
1897..	83,248,054	131,471,127	75,936,000	60,000,000	40,230,400	23,999,873
1898..	86,426,320	107,214,059	75,499,200	62,000,000	40,420,800	33,747,390
1899..	89,610,963	107,914,357	76,988,800	65,000,000	46,558,400	36,901,684
1900..	77,761,382	110,000,000	80,039,680	66,200,000	41,193,600	34,382,309
1901..	82,519,676	101,850,224	79,179,520	70,000,000	41,067,200	39,781,333
1902..	81,248,739	100,000,000	77,235,200	75,000,000	41,000,000	35,831,735
1903..	76,490,869	93,500,000	80,214,400	90,750,000	42,500,278	36,385,000
1904..	80,341,019	90,000,000	80,214,400	94,000,000	41,629,349	58,605,000

PRODUCTION OF VARIOUS MINES.

In the following table are given annual products, either actual figures or careful estimates based upon definite data, for the latest years available, of practically all of the really important copper mines of the world, and

of many of the minor properties making more than 100,000 pounds of refined copper yearly:

(Pounds.)

No.	Mine or Company	Location.	Year	Product.
1	Boston & Montana.	Montana, U. S. A. . .	1904	94,000,000
2	Anaconda.	Montana, U. S. A. . .	1904	90,000,000
3	Calumet & Hecla.	Michigan, U. S. A.	1904	80,341,019
4	Rio Tinto.	Spain.	1904	80,214,400
5	Copper Queen.	Arizona, U. S. A. . .	1904	58,605,000
6	Greene Consolidated.	Mexico.	1904	55,014,339
7	Mansfeld.	Germany.	1904	41,629,349
8	United Copper Co.	Montana, U. S. A. . .	1904	35,311,853
9	Arizona Copper Co.	Arizona, U. S. A. . .	1904	32,197,760
10	Calumet & Arizona.	Arizona, U. S. A. . .	1904	31,634,895
11	United Verde.	Arizona, U. S. A. . .	1904	29,500,000
12	Boleo.	Mexico.	1904	24,517,356
13	Furukawa.	Japan.	1904	21,599,300
14	Colusa-Parrot.	Montana, U. S. A. . .	1904	20,500,000
15	Osceola.	Michigan, U. S. A.	1904	20,472,429
16	Mountain Copper Co.	California, U. S. A. . .	1903	19,116,160
17	Mount Lyell.	Tasmania.	1904	18,462,080
18	Quincy.	Michigan, U. S. A.	1904	18,343,160
19	Cape Copper Co., ...	Cape Col., Nfld. & Norway	1904	17,192,000
20	Detroit.	Arizona, U. S. A. . .	1904	16,623,251
21	Old Dominion.	Arizona, U. S. A. . .	1904	15,368,147
22	Tamarack.	Michigan, U. S. A. . .	1904	14,961,885
23	Ashio.	Japan.	1904	14,622,000
24	Utah Consolidated.	Utah, U. S. A.	1904	13,553,493
25	Granby.	Canada.	1904	13,431,236
26	Tharsis.	Spain.	1904	12,590,226
27	Mitsu Bishi Gosshi Kwaisha. .	Japan.	1903	12,500,000
28	Parrot.	Montana, U. S. A. . .	1904	12,500,000
29	Champion.	Michigan, U. S. A.	1904	12,212,954
30	Baltic.	Michigan, U. S. A.	1904	12,177,729
31	Beashi.	Japan.	1903	12,000,000
32	Butte & Boston.	Montana, U. S. A. . .	1904	12,000,000
33	United States.	Utah, U. S. A.	1904	12,000,000
34	Wallaroo & Moonta.	Australia.	1904	13,070,952
35	Shannon.	Arizona, U. S. A. . .	1904	11,899,920
36	Bingham.	Utah, U. S. A.	1904	11,500,000
37	Sumitomo.	Japan.	1904	11,000,000
38	Trimountain.	Michigan, U. S. A.	1904	10,211,230
39	Lota y Coronel.	Chile.	1903	10,000,000
40	Wolverine.	Michigan, U. S. A.	1904	9,764,455
40	Moctezuma.	Mexico.	1904	9,632,000
42	Great Cobar.	Australia.	1903	9,000,000
43	Tennessee.	Tennessee, U. S. A. . .	1904	8,617,697
44	Mohawk.	Michigan, U. S. A.	1904	8,149,515
45	Sulitelma.	Norway.	1904	7,614,688
46	Teziutlán.	Mexico.	1903	6,786,488
47	Mason & Barry.	Portugal.	1904	6,605,760
48	O'okiep.	Cape Colony.	1904	6,504,960
49	Mazapil.	Mexico.	1903	6,108,123
50	Colorado.	Montana, U. S. A. . .	1904	6,000,000

PRODUCTION OF VARIOUS MINES.—(Continued.)

(Pounds.)

No.	Mine or Company.	Location.	Year.	Product.
51	Guggenheim Exp. Co.	Mexico	1904	6,000,000
52	Santa Rita.	New Mexico, U. S. A.	1904	6,000,000
53	NababEEP.	Cape Colony.....	1904	5,759,040
54	Canadian Copper Co.	Canada.....	1904	5,500,000
55	Namaqua.....	Cape Colony.....	1901	5,376,000
56	Atlantic	Michigan, U. S. A....	1904	5,321,859
57	Central Chili.....	Chile	1904	5,048,960
58	Tyee	Canada.....	1904	5,045,000
59	British Columbia.....	Canada.....	1904	5,081,743
60	Speculator	Montana, U. S. A. . .	1904	5,000,000
61	Descubridora.	Mexico.....	1903	4,964,272
62	Tilt Cove	Newfoundland.	1904	4,928,000
63	Franklin.	Michigan, U. S. A....	1904	4,771,050
64	Katarski	Russia.....	1899	4,765,000
65	Le Roi	Canada.....	1902	4,750,000
66	Copiapó.....	Chile	1902	4,594,240
67	Soc. Ind. de Atacama.....	Chile	1903	4,250,170
68	Mount Garnet	Australia.....	1901	4,220,016
69	Penn-Wyoming.	Wyoming, U. S. A. . .	1904	4,200,000
70	Catemou.	Chile	1904	4,188,740
71	Dolores y Anexas	Mexico	1904	4,015,000
72	Carrizal.	Chile	1903	4,000,000
73	Democrata.	Mexico	1903	3,747,820
74	Las Animas	Chile	1903	3,701,976
75	Rammelsberg.....	Germany.....	1904	3,492,086
76	Santiago Vicuña	Chile	1901	3,250,000
77	Rudianski.....	Russia.....	1899	3,122,112
78	Montecatini	Italy	1903	3,086,440
79	Imperial.....	Arizona, U. S. A. . .	1904	3,030,632
80	Arghana Maden.....	Turkey	1902	3,000,000
81	Artola Hermanos	Chile	1902	3,000,000
82	Chilena de Fundiciones	Chile	1902	3,000,000
83	Compañía Limitada	Chile	1902	3,000,000
84	Maipú.....	Chile	1903	3,000,000
85	Seville Sulphur & Copper Co. .	Spain.....	1904	3,000,000
86	Utah Copper Co.....	Utah, U. S. A.....	1904	3,000,000
87	Yampa (Tintic Co).	Utah, U. S. A.	1904	3,000,000
88	Kedabenski	Russia.....	1904	2,966,720
89	Besa y Ca.	Chile	1901	2,912,000
90	Tinto & Santa Rosa.	Spain.....	1902	2,878,400
91	Coro Coro.	Bolivia.....	1901	2,856,000
92	"Lloyd"	Australia.....	1903	2,815,680
93	Michigan.....	Michigan, U. S. A....	1904	2,746,127
94	New Chillagoe	Australia.....	1903	2,643,200
95	Bogoslovski	Russia.....	1899	2,634,767
96	Bully Hill.	California.....	1904	2,500,000
97	Röros	Norway.....	1902	2,500,000
98	Osaruzawa.....	Japan	1902	2,448,000
99	Isle Royale.....	Michigan, U. S. A....	1904	2,442,905
100	Noel Berthini.....	Bolivia.....	1901	2,419,200
101	Ani	Japan	1904	2,264,000
102	Peña	Spain.....	1904	2,199,680

PRODUCTION OF VARIOUS MINES.—(Continued.)

(Pounds.)

No.	Mine or Company.	Location.	Year.	Product.
103	Mass	Michigan, U S A....	1904	2,182,931
104	Kosaka.	Japan	1900	2,168,756
105	Sado	Japan	1901	2,150,000
106	Daly West	Utah, U. S. A	1904	2,082,000
107	Caucasus.....	Russia.	1904	1,946,360
108	Tiro General	Mexico	1904	1,929,036
109	Queensland Copper Co.	Australia.....	1902	1,928,640
110	Sucesion Cervero.	Chile	1902	1,792,000
111	Bede Metal & Chemical Co....	Spain & Norway. ..	1904	1,783,040
112	Sotiel Coronada.	Spain.....	1899	1,780,800
113	Hibira.	Japan	1900	1,769,498
114	San Miguel.	Spain.....	1899	1,767,360
115	Stadtberger Hütte	Germany.....	1904	1,750,000
116	Arakawa	Japan	1900	1,734,522
117	Jimulco.	Mexico	1904	1,693,957
118	Santa Ines y Morococha	Perú	1904	1,675,000
119	Kusakura.	Japan	1904	1,650,000
120	Ducktown.....	Tennessee, U. S. A. .	1904	1,600,000
121	Castillo del Buitron.	Spain.....	1901	1,500,000
122	Nymagee	Australia.....	1901	1,500,000
123	Orito.	Chile	1902	1,500,000
124	Paramatta	Australia.....	1903	1,500,000
125	Standard.	Arizona, U. S. A. . .	1904	1,500,000
126	Felix Vicuña	Chile	1902	1,500,000
127	Panuco.....	Mexico	1902	1,466,059
128	Utah & Eastern	Utah, U. S. A.	1904	1,448,597
129	Indian Queen (Western)	Montana, U. S. A. . .	1903	1,400,000
130	Galizurski.	Russia.	1899	1,390,095
131	Adventure	Michigan, U. S. A....	1904	1,380,480
132	Kune.	Japan	1904	1,356,300
133	Sucesion C. J. Lambert	Chile	1901	1,350,000
134	Carmen.	Chile	1903	1,325,000
135	Obie.....	Japan	1899	1,316,745
136	Sucesion P. Gonzalez	Chile	1903	1,300,000
137	Gulf Creek	Australia.....	1901	1,254,400
138	Lake George	Australia.....	1901	1,250,000
139	Sucesion Ramon F. Ovalle.....	Chile	1902	1,250,000
140	White Knob.....	Idaho, U. S. A.....	1904	1,250,000
141	Makamine.	Japan	1900	1,208,282
142	Bufa	Mexico	1904	1,200,000
143	Mogollon.....	New Mexico, U. S. A	1904	1,200,000
144	Le Roi No. 2	Canada.....	1904	1,200,000
145	Phoenix	Michigan, U. S. A....	1904	1,162,201
146	Humber	Newfoundland.	1904	1,150,000
147	Las Herrerias.....	Spain.....	1904	1,128,960
148	Van Anda.....	Canada.....	1904	1,127,533
149	CapanneVecchie e Poggio Bindo	Italy	1902	1,100,000
150	Equator	Arizona, U. S. A. . .	1904	1,100,000
151	Snowshoe.....	Canada.....	1904	1,100,000
152	Yoshioka	Japan	1900	1,081,346
153	Itsuki	Japan	1900	1,080,163
154	Helsingborg.....	Sweden.	1901	1,078,384
155	Ogoya	Japan	1899	1,015,759

PRODUCTION OF VARIOUS MINES.—(Continued.)

(Pounds.)

No.	Mine or Company.	Location.	Year.	Product.
156	Aguascalientes Metal Co	Mexico	1903	1,000,000
157	Aljustrel	Portugal	1901	1,000,000
158	Burrage	Australia	1901	1,000,000
159	J. K. Child & Co.	Bolivia	1902	1,000,000
160	Etruscan Copper Co.	Italy	1904	1,000,000
161	Graslitz	Austria	1901	1,000,000
162	Great Central Freehold	Australia	1902	1,000,000
163	Huanchaca de Bolivia	Bolivia	1903	1,000,000
164	Komaki	Japan	1903	1,000,000
165	Llallai	Chile	1901	1,000,000
166	Maitenes	Chile	1901	1,000,000
167	Puquios	Chile	1901	1,000,000
168	Santa Fé	New Mexico, U. S. A	1901	1,000,000
169	Ikuno	Japan	1900	984,355
170	Guillermo Cavallo	Chile	1903	950,000
171	Blayney	Australia	1901	936,320
172	Montreal & Boston	Canada	1904	920,000
173	Mond Nickel Co.	Canada	1901	917,600
174	Cabezas del Pasto	Spain	1902	900,000
175	Carisa	Utah, U. S. A.	1903	900,000
176	Cia. Met. de Torreón	Mexico	1903	984,346
177	Ohio	Utah	1904	850,000
178	United Globe	Arizona, U. S. A.	1901	830,100
179	Mungana (Chillagoe)	Australia	1904	790,720
180	Pitkaranta	Finland	1897	760,500
181	Blinman	Australia	1902	750,000
182	Kupferplatte	Austria	1901	750,000
183	War Eagle	Canada	1901	750,000
184	Horn Silver	Utah, U. S. A.	1902	717,353
185	Altens	Norway	1904	705,472
186	Majestic	Utah, U. S. A.	1903	693,600
187	Soc. Española de Fundicion ..	Chile	1901	675,000
188	Kargalinski	Russia	1899	680,674
189	Broken Hill	Australia	1901	675,000
190	Killingdal	Norway	1904	654,080
191	Girilambone	Australia	1898	650,000
192	Stora Kopparbarg	Sweden	1903	650,000
193	Winona	Michigan U. S. A.	1904	646,025
194	Centennial	Michigan	1904	641,294
195	Nagamatsu	Japan	1904	620,000
196	Omodani	Japan	1900	614,438
197	Carreras Hermanos	Bolivia	1902	600,000
198	Hisanichi	Japan	1900	566,268
199	Libiola	Italy	1903	564,292
200	Fernando	Mexico	1903	554,609
201	Dogamaru	Japan	1900	551,164
202	Furokura	Japan	1904	550,000
203	Aamdal	Norway	1895	537,600
204	Oro Denoro	Canada	1904	529,930
205	Gertrude	Canada	1902	525,000
206	Rossland Great Western	Canada	1902	525,000
207	Yaeger Cañon	Arizona, U. S. A.	1904	520,000

PRODUCTION OF VARIOUS MINES.—(Continued)

(Pounds.)

No.	Mine or Company.	Location.	Year.	Product.
208	El Cobre.....	Cuba.....	1903	500,000
209	Hamley.....	Australia.....	1904	500,000
210	Ligure Ramifera.....	Italy.....	1902	500,000
211	Francisco de P. Perez.....	Chile.....	1903	500,000
212	Tzarevo-Alexandrovski.....	Siberia.....	1902	500,000
213	Brixlegg.....	Austria.....	1902	485,012
214	Atvidaberg.....	Sweden.....	1901	450,000
215	Funatsu.....	Japan.....	1903	450,000
216	Hall.....	Canada.....	1904	448,924
217	Hampden.....	Australia.....	1901	431,692
218	Spence.....	California, U. S. A....	1902	425,000
219	Crowl Creek.....	Australia.....	1904	400,000
220	Mount Molloy.....	Australia.....	1902	400,000
221	Naverfjord.....	Norway.....	1902	396,828
222	Val Verde.....	Arizona, U. S. A....	1903	379,639
223	Nafverberg.....	Sweden.....	1901	375,000
224	Chiapas.....	Mexico.....	1903	370,483
225	Ahmeek.....	Michigan, U. S. A....	1904	350,000
226	Cañon.....	Arizona, U. S. A....	1904	350,000
227	Geisse Hermanos.....	Chile.....	1902	350,000
228	Kokusei.....	Japan.....	1899	348,497
229	Cobar Chesney.....	Australia.....	1902	325,000
230	Otto Harnecker.....	Chile.....	1902	300,000
231	Mizusawa.....	Japan.....	1904	296,000
232	New Mount Hope.....	Australia.....	1898	293,440
233	Sasagatini.....	Japan.....	1900	274,412
234	Bossmo.....	Norway.....	1902	250,000
235	Lower Mammoth.....	Utah, U. S. A....	1901	250,000
236	Las Vigas.....	Mexico.....	1903	250,000
237	Rambler.....	Wyoming, U. S. A....	1903	249,196
238	Omaki.....	Japan.....	1896	242,690
239	Wissener.....	Germany.....	1902	240,742
240	Mount Morgan Gold.....	Australia.....	1903	237,440
241	Einaasleigh Freehold.....	Australia.....	1901	232,960
242	Clemente Ham.....	Mexico.....	1902	231,830
243	Ate.....	Japan.....	1900	231,424
244	Burra Burra.....	Australia.....	1903	225,000
245	Quilomenco.....	Chile.....	1901	225,000
246	Francisco Vergara I.....	Chile.....	1901	225,000
247	Avino.....	Mexico.....	1903	221,403
248	Mendoza y Ca.....	Mexico.....	1903	218,874
249	Monterey.....	Mexico.....	1903	215,568
250	Kafveltorps.....	Sweden.....	1901	214,919
251	Eclipse-Argo.....	Montana, U. S. A....	1903	204,570
252	Cucharas.....	Mexico.....	1903	200,618
253	J. M. Echevarria.....	Chile.....	1902	200,000
254	Otori.....	Japan.....	1904	187,000
255	Tsuboi.....	Japan.....	1900	183,876
256	Nishinokawa.....	Japan.....	1900	183,415
257	Coahuila.....	Mexico.....	1903	178,865
258	Boberthaler.....	Germany.....	1902	176,368
259	Maximilian.....	Germany.....	1904	175,000

PRODUCTION OF VARIOUS MINES.—(Continued.)

(Pounds.)

No.	Mine or Company.	Location.	Year.	Product.
260	Merisaki	Russia	1899	164,092
261	Shamblurgaki.....	Russia	1899	162,142
262	Kurotaki.....	Japan	1900	151,890
263	Castellanos y Ca	Chile	1902	150,000
264	Hogasho.	Japan	1900	138,032
265	Sawatari.	Japan	1900	137,191
266	Papovski.	Siberia	1899	129,497
267	San Carlos	Mexico	1903	125,000
268	Los Ocotes.	Mexico	1904	121,000
269	Hisamune.	Japan	1899	112,196
270	Turgovski.	Russia	1900	111,686
271	Maze.....	Japan	1900	110,582
272	Silver Spur.	Australia.....	1903	110,000
273	Irigoyen Hermanos y Ca.	Mexico	1902	107,804
274	Higashiyama.....	Japan	1898	104,424
275	Hecia Consolidated.....	Montana, U. S. A. .	1901	103,671
276	Dingo	Australia.....	1901	100,000
277	La Dura.....	Mexico	1903	100,000
278	José R. Espinoza.....	Chile	1902	100,000
279	Sucesion Francisco Geisse	Chile	1902	100,000
280	Omori.....	Japan	1903	100,000
281	Quintera.	Mexico	1902	100,000
282	Yamate.....	Japan	1901	100,000

WORLD'S PRODUCTION FOR THE NINETEENTH CENTURY.

(Long Tons.)

DECADE.	Average Price of Rough Copper.	World's Production of Each Decade.	Increase of Production over Previous Decades.	Average Annual Production for Each Decade.	Increase of Average Annual Production.
1801 to 1810	£160	91,000	.....	9,100	.....
1811 to 1820	130	96,000	5,000	9,600	500
1821 to 1830	101	135,000	39,000	13,500	3,900
1831 to 1840	94	218,400	83,400	21,840	8,340
1841 to 1850	83	291,000	72,600	29,100	7,260
1851 to 1860	111	506,999	215,999	50,699	21,599
1861 to 1870	87	900,000	393,001	90,000	39,300
1871 to 1880	79	1,189,000	289,000	118,900	28,900
1881 to 1890	60	2,373,398	1,084,398	237,339	108,439
1891 to 1900	52	3,708,901	1,335,503	370,890	133,550
Totals and Averages	96	9,507,299	.....	95,073	.....

ESTIMATE OF WORLD'S PRODUCTION FOR 1904.

The following table gives figures of actual production for the years 1902 and 1903, and estimated production of the year 1904. As final figures of production will not be available until the latter half of 1905, the figures for 1904 must be taken merely for what they purport to be, which is, an estimate, based upon the best data available early in the year, of the production of the previous year. A similar estimate, prepared one year ago for the preceding annual edition of the Copper Handbook, under similar circumstances, proved to be seven-tenths of one per cent. under the actual figures of production by the world for the year 1903.

(Long Tons.)			
Country.	1902.	1903.	1904.
Argentina	240	135	300
Australasia	28,640	29,468	30,000
Austria.....	1,015	1,055	1,000
Bolivia	2,000	2,000	2,000
Canada	17,485	19,321	21,500
Chile	28,930	30,930	33,000
Cape Colony.....	4,450	5,230	5,900
Great Britain	600	500	500
Germany	21,605	21,205	21,500
Hungary	485	330	500
Italy	3,370	3,100	3,250
Japan	29,775	31,360	32,000
Mexico.....	35,785	50,480	57,500
Newfoundland	2,000	2,710	3,000
Norway	4,565	5,915	6,500
Peru.....	7,580	7,800	8,000
Russia	8,000	10,320	9,000
Sweden	455	455	450
Spain and Portugal.....	49,790	49,740	51,000
United States.....	294,297	311,582	345,000
Turkey.....	1,100	1,400	1,250
Totals.....	542,167	585,081	628,150

The foregoing figures show annual increases in production as follows: 5.8% in 1901; 5.7% in 1902; 8.0% in 1903, and, based upon the estimate for last year, 7.4% for 1904.

AMERICAN COPPER PRODUCTION.

(Long Tons.)

Year.	United States Total Production	Michigan		Montana		Arizona	
		Produc- tion	Per cent of total	Produc- tion	Per cent of total	Produc- tion	Per cent of total
1850.....	650	572	88	.....	..	.....	..
1851.....	900	779	86	.....	..	.....	..
1852.....	1,100	792	72	.....	..	.....	..
1853.....	2,000	1,297	65	.....	..	.....	..
1854.....	2,250	1,819	81	.....	..	.....	..
1855.....	3,000	2,593	86	.....	..	.....	..
1856.....	4,000	3,666	91	.....	..	.....	..
1857.....	4,800	4,255	88	.....	..	.....	..
1858.....	5,500	4,088	74	.....	..	.....	..
1859.....	6,300	3,985	63	.....	..	.....	..

AMERICAN COPPER PRODUCTION.—(Continued.)

(Long Tons.)

Year.	United States Total Production	Michigan— Produc- tion	Per cent of total	Montana— Produc- tion	Per cent of total	Arizona— Produc- tion.	Per cent of total
1860.....	7,200	5,388	74	.....	..	.....	..
1861.....	7,500	6,713	89	.....	..	.....	..
1862.....	9,000	6,065	67	.....	..	.....	..
1863.....	8,500	5,797	68	.....	..	.....	..
1864.....	8,000	5,576	69	.....	..	.....	..
1865.....	8,500	6,410	75	.....	..	.....	..
1866.....	8,900	6,138	69	.....	..	.....	..
1867.....	10,000	7,824	78	.....	..	.....	..
1868.....	11,600	9,346	80	.....	..	.....	..
1869.....	12,500	11,886	95	.....	..	.....	..
1870.....	12,600	10,992	87	.....	..	.....	..
1871.....	13,000	11,942	91	.....	..	.....	..
1872.....	12,500	10,961	87	.....	..	.....	..
1873.....	15,500	13,433	86	.....	..	.....	..
1874.....	17,500	15,327	87	.....	..	.....	..
1875.....	18,000	16,069	89	.....	..	.....	..
1876.....	19,000	17,085	89	.....	..	.....	..
1877.....	21,000	17,422	83	.....	..	.....	..
1878.....	21,500	17,719	82	.....	..	.....	..
1879.....	23,000	19,129	83	.....	..	.....	..
1880.....	27,000	22,204	82	.....	..	.....	..
1881.....	32,000	24,363	76	.....	..	.....	..
1882.....	40,467	25,439	62	.....	..	.....	..
1883.....	51,574	26,653	51	11,011	21	10,658	21
1884.....	64,708	30,961	47	19,256	30	11,935	18
1885.....	74,052	32,209	43	30,267	41	10,137	14
1886.....	70,430	36,124	51	25,362	36	6,990	10
1887.....	81,017	33,941	42	35,133	43	7,910	10
1888.....	101,054	38,604	38	43,704	43	14,195	14
1889.....	101,239	39,364	38	43,849	43	13,654	13
1890.....	115,966	45,273	39	50,437	43	15,534	13
1891.....	126,839	50,992	40	50,028	39	17,800	14
1892.....	154,018	54,999	36	72,860	47	17,160	11
1893.....	147,033	50,270	34	69,290	47	19,200	13
1894.....	158,120	51,031	32	81,729	52	19,873	13
1895.....	169,917	57,737	34	84,900	50	21,408	13
1896.....	205,384	63,418	31	99,071	48	32,560	16
1897.....	220,571	63,706	29	102,807	47	36,398	17
1898.....	235,050	66,056	28	92,041	39	49,624	21
1899.....	253,870	65,603	26	100,503	40	59,399	23
1900.....	269,111	63,461	24	120,865	45	52,820	20
1901.....	268,522	69,501	26	102,620	38	58,383	22
1902.....	294,297	76,050	26	128,975	44	53,546	18
1903.....	311,582	85,848	27	121,677	39	65,914	21

UNITED STATES COPPER PRODUCTION BY STATES.

State.	1898-1903.			
	(Pounds.)			
	1900.	1901.	1902.	1903.
Montana	270,738,489	229,870,415	288,903,820	272,555,854
Michigan	142,153,171	155,604,145	170,325,598	192,299,191
Arizona	118,317,764	130,778,611	119,944,944	147,648,271
California	28,511,225	33,667,456	25,038,724	17,776,756
Utah	18,354,726	20,116,979	23,939,901	38,302,602
Colorado	7,826,949	9,801,783	8,422,030	4,158,368
East and South...	4,820,495	6,860,039	13,599,047	13,855,612
New Mexico	4,169,400	9,629,884	6,614,961	7,300,832
Wyoming	4,203,776	2,698,712	889,228	1,023,189
South Dakota	15,147	753,510	445,663	173,202
Nevada	407,535	593,608	164,301	150,000
Idaho	290,162	480,511	227,500	778,906
Alaska				1,339,590
Washington			209,297	80,758
Miscellaneous	3,000,000	531,530	500,000	500,000
Total domestic ..	602,808,839	601,499,886	659,225,014	697,943,131
From imported ores and matte	36,380,000	64,000,000	40,000,000	32,000,000
Gross Production..	639,188,839	665,499,886	699,225,014	729,943,131

LAKE SUPERIOR COPPER PRODUCTION BY MINES.

1901-1904.

Except where denoted by asterisks, the figures in the following table are official and final.

Mines.	(Pounds Avoirdupois.)			
	1901.	1902.	1903.	1904.
Calumet & Hecla..	82,519,676	81,248,739	76,490,869	80,341,019
Osceola	13,723,487	13,416,396	16,059,636	20,472,429
Quincy	20,540,720	18,988,491	18,498,288	18,343,160
Tamarack	18,000,852	15,961,528	15,286,093	14,961,885
Champion		4,165,784	10,564,147	12,212,954
Baltic.	2,641,432	6,285,819	10,580,997	12,177,729
Trimountain		5,732,160	9,237,051	10,211,230
Wolverine	4,946,126	6,473,181	9,024,034	9,764,455
Mohawk	160,897	226,824	6,284,327	8,149,515
Atlantic	4,666,880	4,949,366	5,505,598	5,321,859
Franklin	3,757,419	5,237,460	5,309,030	4,771,050
Michigan		166,898	275,708	2,746,127
Isle Royale	2,171,955	3,569,748	3,134,601	2,442,905
Mass.	837,297	2,345,805	2,576,447	2,182,931
Adventure	29,361	606,211	2,182,608	1,380,480
Phoenix	93,643		202,823	1,162,201
Winona		101,188	1,036,944	646,025
Centennial	806,400			641,294
Ahmeek				*350,000
Arcadian	*500,000	*600,000		
Arnold	108,000			
Miscellaneous	*50,000	*250,000	*50,000	*50,000
Totals	155,604,145	170,325,598	192,299,191	208,329,248

PRODUCTION, VALUE AND DIVIDENDS OF LAKE COPPER.

Year.	Gross Product fine copper (Pounds).	Gross value of production (Dollars).	Total Dividends paid (Dollars).	Percentage of dividends to gross values.	Dividends per pound of copper (Cents).
1845....	24,880	5,000	.....	....	.....
1846....	58,240	10,000	.....	....	.....
1847....	297,120	55,000	.....	....	.....
1848....	1,032,640	200,900	.....	....	.....
1849....	1,505,280	336,000	60,000	17.0	3.98
1850....	1,281,280	286,000	84,000	29.0	6.55
1851....	1,744,960	289,500	60,000	12.0	3.43
1852....	1,774,080	396,000	60,000	15.0	3.38
1853....	2,905,280	648,500	90,000	14.0	3.09
1854....	4,074,560	909,500	198,000	21.0	4.85
1855....	5,809,334	1,586,160	168,000	10.0	2.89
1856....	8,217,392	2,218,320	380,000	17.0	4.62
1857....	9,530,830	2,382,500	480,000	20.0	5.03
1858....	9,159,916	2,129,235	460,000	21.0	5.00
1859....	8,937,995	1,950,355	360,000	18.0	4.02
1860....	12,068,375	2,654,960	120,000	5.0	0.99
1861....	15,182,837	3,487,995	260,000	7.0	1.70
1862....	13,586,318	3,634,255	440,000	12.0	3.23
1863....	12,985,444	4,415,600	720,000	16.0	5.54
1864....	12,491,965	5,870,300	1,150,000	19.0	9.20
1865....	14,358,592	5,635,515	510,000	9.0	3.55
1866....	13,750,063	4,629,375	170,000	3.7	1.23
1867....	17,515,607	4,442,841	110,000	2.4	0.63
1868....	20,934,124	4,940,424	100,000	2.0	0.47
1869....	26,625,301	6,230,016	210,000	3.4	0.78
1870....	24,622,759	5,096,752	700,000	13.0	2.84
1871....	25,746,448	5,728,485	1,640,000	29.0	6.36
1872....	24,553,523	7,979,400	3,080,000	38.0	11.54
1873....	30,291,505	8,726,100	2,330,000	27.0	7.69
1874....	34,334,389	8,009,356	1,940,000	24.0	5.06
1875....	36,039,497	8,180,625	1,920,000	23.0	5.32
1876....	38,270,997	7,998,430	1,870,000	23.0	4.88
1877....	39,026,671	7,327,880	1,840,000	25.0	4.71
1878....	41,687,266	6,920,540	1,860,000	27.0	4.46
1879....	42,671,529	7,327,350	1,818,620	25.0	4.26
1880....	49,718,337	9,947,673	3,080,000	30.9	6.19
1881....	54,548,909	9,971,702	2,665,000	26.7	4.88
1882....	57,155,980	10,522,416	2,850,000	27.1	4.99
1883....	59,702,404	9,457,853	2,670,000	28.1	4.47
1884....	69,353,202	9,494,306	1,327,500	12.9	1.91
1885....	72,147,889	7,942,597	1,970,000	24.8	2.73
1886....	80,918,460	8,788,476	1,900,000	21.5	2.34
1887....	76,028,697	8,530,342	1,370,000	16.1	1.80
1888....	86,472,034	14,510,001	3,260,000	22.4	3.77
1889....	88,175,675	11,894,942	2,670,000	22.4	3.03
1890....	101,410,277	15,819,960	3,415,000	21.6	3.36
1891....	114,222,709	14,574,727	3,540,000	24.3	3.10
1892....	123,198,460	12,431,624	3,260,000	26.2	2.64
1893....	112,605,078	12,105,145	3,520,000	29.1	3.12
1894....	114,306,870	10,852,122	2,380,000	21.9	2.08
1895....	129,330,749	13,877,109	3,280,000	23.6	2.54
1896....	142,057,500	15,758,935	3,985,000	25.3	2.80
1897....	142,702,586	16,530,843	5,431,000	32.8	3.80

PRODUCTION, VALUE AND DIVIDENDS OF LAKE COPPER.—Cont'd.

Year.	Gross Product fine copper (Pounds.)	Gross value of production (Dollars.)	Total Dividends paid (Dollars.)	Percentage of dividends to gross values.	Dividends per pound of copper (Cents.)
1898....	147,965,738	17,829,871	6,857,250	38.4	4.63
1899....	146,950,338	26,098,382	12,318,450	47.2	8.39
1900....	142,151,571	23,691,928	9,811,200	41.3	6.90
1901....	155,716,848	26,038,857	7,496,900	28.8	4.81
1902....	170,325,598	20,711,592	3,440,000	16.6	2.02
1903....	192,299,191	26,383,449	4,980,000	18.8	2.59
1904....	205,488,229	26,713,469	5,432,300	20.3	2.64
Totals..	3,377,359,733	512,906,599	128,098,220	24.9	3.79

AMERICAN COPPER EXPORTS.

The United States government estimates of exports of copper, including ingot and various forms of refined copper, matte, blister copper and ores, and manufactured products, from 1864 until 1902, inclusive are as follows:

(Cwts. and Pounds.)

Year Ending—	Ore and Matte. Cwts.	Refined. Pounds.	Total Value.
June 30, 1864.....	109,581	102,831	\$ 432,570
1865.....	225,197	1,572,382	1,544,870
1866.....	215,080	123,444	936,211
1867.....	87,731	4,637,867	791,901
1868.....	92,612	1,350,896	922,409
1869.....	121,418	1,134,360	592,698
1870.....	19,198	2,214,658	1,042,246
1871.....	54,445	581,650	915,431
1872.....	35,564	267,868	287,735
1873.....	45,252	38,958	259,076
1874.....	13,326	503,160	467,208
1875.....	51,305	5,123,470	1,815,266
1876.....	15,304	14,304,160	3,526,410
1877.....	21,432	13,461,553	3,023,394
1878.....	32,947	11,297,876	2,488,921
1879.....	23,070	17,207,739	2,933,205
1880.....	21,623	4,206,258	849,218
1881.....	9,958	4,865,407	876,395
1882.....	25,936	3,340,531	748,456
1883.....	112,923	8,221,363	2,348,004
1884.....	386,140	17,044,760	5,595,859
1885.....	432,300	44,731,858	10,187,024
Dec. 31, 1886.....	417,520	19,553,421	4,380,322
1887.....	501,280	12,471,393	4,114,456
1888.....	794,960	31,706,527	11,897,240
1889.....	818,500	16,813,410	10,209,722
1890.....	431,411	10,971,899	5,918,395
1891.....	672,120	69,279,024	15,703,543
1892.....	943,040	30,515,736	10,162,870
1893.....	835,040	138,984,128	18,935,497
1894.....	87,040	162,393,000	16,143,094
1895.....	276,480	121,328,390	14,938,309
1896.....	414,265	259,223,924	31,035,211
1897.....	181,280	277,265,742	32,755,053
1898.....	186,860	291,955,905	35,545,251
1899.....	74,540	246,826,331	43,485,654
1900.....	200,140	337,973,751	58,875,439
1901.....	292,260	194,249,828	36,071,448
1902.....	201,992	354,668,849	46,811,729
1903.....	137,659	310,729,524	44,365,155

AMERICAN EXPORTS OF REFINED COPPER.

1893-1902.

The following figures, showing American exports of copper, in long tons, from 1893 to 1902, inclusive, are furnished by Mr. John Stanton, of New York, secretary of the American Copper Producers' Association:

(Long Tons.)

Year	Exports.
1893.....	80,392
1894.....	77,527
1895.....	64,722
1896.....	125,605
1897.....	129,210
1898.....	145,115
1899.....	119,811
1900.....	160,062
1901.....	94,366
1902.....	164,451

AMERICAN EXPORTS BY PORTS.

(Pounds Avoirdupois)

Port of Export.	1900.	1901.	1902.	1903.
Baltimore.....	86,264,231	54,377,355	103,607,256	88,296,071
Boston.....	1,496,387	27,917	426,069	512,053
Newport News, Va.	2,016,000	1,568,567	5,070,026	1,969,177
Norfolk, Va.			598,339	1,771,993
New York.....	230,178,643	133,540,150	236,622,515	211,879,055
Philadelphia.....	12,468,680	3,526,130	5,804,743	3,845,307
New Orleans.....	3,937,350	1,806	1,819	3,014
Galveston.....				
Detroit.....	469,819	387,923	812,828	611,327
Port Huron, Mich.....	149,525	92,062	208,849	261,820
Burlington, Vt.....	678,589	434,692		491,921
Miscellaneous.....	314,527	293,226	1,516,405	1,087,786
Totals.....	337,973,751	194,249,828	354,668,849	310,729,524

AMERICAN COPPER EXPORTS BY DESTINATIONS.

(Pounds Avoirdupois.)

Destination.	1900.	1901.	1902.	1903.
Great Britain and Ireland.	63,522,445	36,819,100	88,972,029	47,140,717
Holland.....	101,398,394	61,752,002	96,358,472	96,927,346
France.....	67,725,989	34,607,042	63,519,881	53,745,221
Germany.....	67,348,848	37,487,180	56,604,753	71,130,077
Belgium.....	12,554,191	4,561,405	8,431,560	4,207,720
Austria-Hungary.....	11,258,115	8,616,964	28,539,742	16,516,663
Russia.....	5,650,423	2,889,270		10,411,679
Italy.....	5,550,285	5,045,775	9,108,904	7,774,016
Other Countries.....	2,965,061	2,471,090	3,133,508	2,874,085
Totals.....	337,973,751	194,249,828	354,668,849	310,729,524

AMERICAN IMPORTS OF COPPER.

The following table showing imports of copper into the United States, in various forms, is summarized from the official figures of the United States government. The figures are somewhat unsatisfactory, for the reason that after and including 1895 the figures of ore are for gross weight of imported ore, while for preceding years the figures are for copper content of the ore:

(Pounds Avoirdupois.)

Year.	Ore.	Copper in Matte.	Raw Copper.	Old Copper.	Estimated Total.
1890...	3,448,237	221,838	5,189	284,789	3,960,053
1891...	8,931,554	2,403,919	2,556	134,407	11,472,436
1892...	7,669,978	303,087	22,097	71,485	8,066,647
1893...	7,256,015	3,175,559	554,348	59,375	11,045,297
1894...	4,804,614	5,873,820	606,415	160,592	11,445,441
1895...	a8,921,920	a3,104,640	7,979,322	1,336,901	.....
1896...	a2,620,800	a3,427,200	9,074,379	2,422,554	.....
1897...	a43,919,680	2,974,720	12,646,552	1,780,390	28,923,098
1898...	a107,253,440	1,583,680	5,892,944	1,986,133	73,916,467
1899...	a120,934,616	7,763,885	64,282,583	6,678,145	95,722,340
1900...	a109,123,840	27,534,080	62,404,489	3,354,756	105,176,808
1901...	a131,790,400	75,913,600	71,001,713	2,818,757	137,826,406
1902...	a334,010,800	52,978,240	112,420,253	2,119,031	194,501,757
1903...	a607,407,360	30,461,760	133,472,398	3,235,597	168,707,995

a. Gross weight of ore.

COPPER IMPORTED FOR AMERICAN CONSUMPTION.

Of the copper imported into the United States, 1890-1902, inclusive, the following amounts have been entered at the custom-houses for American consumption:

(Pounds Avoirdupois.)

Year.	New Copper.	Old Copper.	Total.	Value.
1890.....	5,189	284,789	289,978	\$ 27,322
1891.....	2,556	134,407	136,963	10,074
1892.....	22,097	71,485	93,582	8,702
1893.....	554,338	59,375	613,713	65,425
1894.....	606,415	160,592	767,007	58,414
1895.....	7,979,322	1,336,901	9,316,223	836,687
1896.....	9,074,379	2,422,554	11,496,933	947,395
1897.....	12,646,552	1,780,390	14,426,942	1,301,355
1898.....	35,892,944	1,986,133	37,879,077	3,262,946
1899.....	64,282,583	6,678,145	70,960,728	10,108,592
1900.....	62,404,489	3,354,756	65,759,245	10,305,016
1901.....	71,001,713	2,818,757	73,820,470	11,904,281
1902.....	112,420,253	2,119,031	114,539,284	12,834,970
1903.....	132,762,334	3,235,597	135,997,931	17,152,203

AMERICAN COPPER SUPPLY.

(Pounds Avoirdupois.)

Year.	Domestic Production.	Imports.	Total Supply.	Exports.	Net Supply.
1892...	344,998,679	8,066,647	353,065,326	96,515,736	256,549,590
1893...	329,354,398	11,045,297	340,399,695	188,984,128	151,415,567
1894...	354,188,374	11,445,441	365,633,815	168,143,000	197,490,815
1895...	380,613,404	14,616,223	395,229,627	136,528,390	258,701,237
1896...	460,061,430	17,297,272	477,358,702	282,105,860	195,252,842
1897...	494,078,274	28,578,420	522,656,694	288,662,340	233,994,354
1898...	526,512,987	73,916,467	600,429,454	321,023,873	279,405,581
1899...	568,666,921	95,722,340	664,389,261	252,876,480	411,512,781
1900...	606,117,166	105,176,808	711,293,974	348,402,853	362,891,121
1901...	602,072,519	137,826,406	739,898,925	222,137,911	517,761,014
1902...	659,225,014	194,501,757	853,726,771	354,668,849	499,057,922
1903...	729,943,131	168,707,995	898,651,126	310,729,524	587,921,602

AMERICAN COPPER TRADE.

This table, compiled by the Metalgesellschaft & Metallurgische Gesellschaft A.-G., of Frankfort-on-Main, Germany, is based upon the official statistics of the United States government. The production, given in the first column, includes copper produced from imported ores and matte, as well as copper from domestic ore and regulus:

(Metric Tons.)				
Year.	Production.	Imports.	Exports.	Supply.
1892.....	151,163	784	43,004	108,943
1893.....	152,272	2,512	87,492	67,292
1894.....	164,095	1,563	77,089	88,569
1895.....	178,341	4,253	63,759	118,835
1896.....	219,328	5,186	128,548	95,966
1897.....	230,185	7,543	131,730	105,998
1898.....	250,000	24,646	150,721	123,925
1899.....	273,000	32,516	116,629	188,887
1900.....	283,000	31,303	160,403	153,900
1901.....	317,500	33,600	110,500	240,600
1902.....	341,100	46,925	184,800	203,225
1903.....	320,000	62,200	152,000	230,200

BRITISH AND FRENCH STOCKS OF COPPER.

The following table gives the estimates of stocks of refined copper on hand in Great Britain and France, on the first day of January of each year named. The first column gives actual stocks on hand, the second column giving the "visible supply," which in addition to stocks on hand includes shipments afloat from Chile and Australia to European ports:

(Long Tons.)		
Year.	Public Stocks.	Visible Supply.
1888.....	35,001.....	.....
1889.....	96,194.....	104,091
1890.....	94,942.....	98,847
1891.....	62,449.....	65,366
1892.....	53,486.....	.....
1893.....	51,556.....	.....
1894.....	43,428.....	.....
1895.....	51,575.....	.....
1896.....	43,604.....	45,817
1897.....	31,776.....	34,927
1898.....	27,895.....	31,955
1899.....	22,346.....	27,913
1900.....	17,517.....	22,935
1901.....	24,435.....	28,921
1902.....	15,701.....	22,063
1903.....	11,215.....	16,540
1904.....	5,601.....	13,851
1905.....	10,009.....	16,734

ENGLISH COPPER TRADE.

(Long Tons.)

Year.	Copper.	Imports Ore and Matte.	Total.	Exports.	Apparent Consumption.
1860.....	13,142	13,715	26,857	26,117	.....
1865.....	23,137	23,922	47,059	41,398	.....
1870.....	30,724	27,025	57,749	53,006	.....
1871.....	33,228	23,671	56,899	56,633	.....
1872.....	49,000	21,702	70,702	53,195	.....
1873.....	35,840	26,756	62,596	56,716	.....
1874.....	39,906	27,894	67,800	59,742	.....
1875.....	41,931	29,483	71,414	51,870	.....
1876.....	39,145	36,191	75,336	52,468	.....
1877.....	39,743	53,582	93,325	54,088	.....
1878.....	39,360	48,212	87,572	55,001	.....
1879.....	46,670	50,421	97,091	62,412	30,774
1880.....	36,509	56,225	92,734	59,482	32,879
1881.....	32,170	54,057	86,227	61,689	31,607
1882.....	35,509	58,366	93,875	55,683	42,877
1883.....	35,653	63,493	99,146	59,350	40,469
1884.....	39,767	69,623	109,390	64,691	51,263
1885.....	41,933	81,616	123,549	62,080	54,323
1886.....	42,969	65,046	108,015	60,511	41,158
1887.....	29,198	73,891	103,089	69,453	53,096
1888.....	44,063	90,867	135,470	72,066	42,562
1889.....	b38,576	101,407	139,983	75,627	65,759
1890.....	c49,461	91,788	141,249	89,747	66,170
1891.....	44,213	94,403	138,616	76,056	59,223
1892.....	d35,015	99,356	134,371	82,542	e48,367
1893.....	41,829	88,003	129,832	70,986	66,817
1894.....	56,157	68,851	125,008	54,689	f50,330
1895.....	42,135	77,806	119,941	65,990	f50,692
1896.....	60,458	75,398	135,856	59,334	f76,036
1897.....	60,428	76,127	136,555	56,542	f69,787
1898.....	67,978	71,726	139,704	63,256	f69,284
1899.....	58,880	82,730	141,610	75,271	f60,877
1900.....	70,247	84,694	154,941	56,997	f81,896
1901.....	66,764	82,814	149,578	70,396	f70,178
1902.....	90,022	70,179	160,201	69,156	f80,223
1903.....	62,879	70,047	132,926	76,305	f56,621

a. Including 22,557 tons of Chile bars transferred to France.

b. Including 1,166 tons of Chile bars transferred from France to England.

c. Including 3,501 tons of Chile bars transferred from France to England.

d. Including 3,585 tons of Chile bars transferred from France to England.

e. Add 4,001 tons for comparison with former years, the difference arising from the new method of making up stock.

f. Deducting copper contents of sulphate exported (13,078 tons in 1898, 10,045 tons in 1899, 10,728 tons in 1900, 9,004 tons in 1901 and 10,822 tons in 1902).

GERMAN COPPER TRADE.

(Compiled by Metalgesellschaft & Metallurgische Gesellschaft A.-G.)

(Metric Tons.)

Year.	Production.	Imports.	Exports.	Consumption.
1884.....	18,113	13,819	6,906	25,026
1885.....	19,928	13,168	5,706	27,390
1886.....	19,314	11,913	6,510	24,717
1887.....	20,192	12,427	5,154	27,465
1888.....	21,017	8,082	4,530	24,569
1889.....	24,160	29,643	7,135	46,668
1890.....	24,427	31,408	8,428	47,407
1891.....	24,092	34,182	6,247	52,027
1892.....	24,781	32,498	6,598	50,681
1893.....	24,011	38,455	7,517	54,949
1894.....	25,722	37,032	6,609	56,145
1895.....	25,777	44,365	6,329	63,813
1896.....	29,319	56,115	5,996	79,438
1897.....	29,408	67,573	7,183	89,798
1898.....	30,695	73,291	6,972	97,014
1899.....	34,634	70,091	7,061	97,664
1900.....	30,929	83,503	5,505	108,927
1901.....	31,317	58,620	5,097	84,840
1902.....	30,591	76,050	4,678	101,963
1903.....	31,214	83,261	4,333	110,142

FRENCH COPPER TRADE.

(Metric Tons.)

Year.	Production	Imports.	Exports.	Consumption.
1892.....	6,400	24,154	2,116	28,438
1893.....	6,600	26,060	2,204	30,456
1894.....	6,400	26,756	2,467	30,689
1895.....	8,245	32,656	3,163	37,738
1896.....	6,544	40,136	3,456	43,224
1897.....	7,400	48,028	3,559	51,869
1898.....	7,834	45,575	4,044	49,365
1899.....	6,600	49,515	6,882	49,233
1900.....	6,400	51,962	5,736	52,626
1901.....	7,000	41,196	5,122	43,074
1902.....	7,300	49,094	3,485	52,909
1903.....	7,100	46,834	4,658	49,276

AUSTRO-HUNGARIAN COPPER TRADE.

(Metric Tons.)

Year.	Production.	Imports.	Exports.	Consumption.
1892.....	1,295	8,644	342	9,597
1893.....	1,396	11,822	434	12,784
1894.....	1,726	13,383	255	14,854
1895.....	1,276	11,747	151	12,872
1896.....	1,366	13,666	228	14,804
1897.....	1,426	15,926	159	17,193
1898.....	1,343	17,442	173	18,612
1899.....	1,479	16,185	534	17,130
1900.....	1,200	18,970	471	19,699
1901.....	1,150	17,504	435	18,219
1902.....	1,350	18,256	436	19,170
1903.....	1,400	18,704	1,054	19,050

RUSSIAN COPPER TRADE.

(Metric Tons.)				
Year.	Production.	Imports.	Exports.	Consumption.
1892.....	4,978	6,568	....	11,546
1893.....	5,100	8,756	....	13,856
1894.....	5,409	6,666	....	12,075
1895.....	5,854	8,100	....	13,954
1896.....	5,832	12,433	....	18,265
1897.....	6,941	12,507	....	19,448
1898.....	7,291	10,200	....	17,491
1899.....	7,533	6,300	....	13,833
1900.....	8,100	6,100	....	14,200
1901.....	8,100	6,000	....	14,100
1902.....	8,800	8,700	....	17,500
1903.....	10,500	7,300	....	17,800

ITALIAN COPPER TRADE.

(Metric Tons.)				
Year.	Production	Imports.	Exports.	Consumption.
1892.....	2,564	2,139	168	4,535
1893.....	2,371	3,043	157	5,257
1894.....	2,670	3,706	32	6,344
1895.....	2,375	4,350	84	6,641
1896.....	2,842	4,509	383	6,968
1897.....	2,980	5,032	222	7,790
1898.....	3,230	5,028	462	7,796
1899.....	3,032	6,006	1,355	7,683
1900.....	2,797	6,224	676	8,345
1901.....	3,483	5,982	100	9,365
1902.....	3,863	7,050	165	10,748
1903.....	3,900	6,096	162	9,834

MISCELLANEOUS EUROPEAN COPPER TRADE.

Sweden, Norway, Denmark, Switzerland, Spain, Portugal and Balkan states.

(Not including Spanish and Portuguese Production.)

(Compiled by Metallegesellschaft & Metallurgische Gesellschaft A.-G.)

(Metric Tons.)				
Year.	Production.	Imports.	Exports.	Consumption.
1892.....	1,400	1,100	800	1,700
1893.....	1,600	1,400	1,000	2,000
1894.....	1,600	1,400	700	2,100
1895.....	1,500	1,400	1,100	1,800
1896.....	1,700	1,400	800	2,300
1897.....	1,700	1,500	1,200	2,000
1898.....	1,500	1,700	1,500	1,700
1899.....	2,300	1,800	2,100	2,000
1900.....	2,500	1,600	2,100	2,000
1901.....	3,100	2,200	2,700	2,600
1902.....	10,000	2,300	9,900	2,400
1903.....	12,200	1,500	11,300	2,400

WORLD'S PRODUCTION OF RAW COPPER.

The following table, prepared by the *Metallgesellschaft & Metallurgische Gesellschaft A.-G.*, includes in the figures of production for each country the copper estimated to have been actually produced from native and imported ores, from impure raw copper brought in for refining, and from imported refined raw copper.

(Metric Tons.)

Country.	1895	1897	1899	1900	1901	1902	1903.
United States . . .	170,100	224,800	270,100	277,000	281,600	341,100	362,800
Great Britain . . .	78,246	75,000	79,100	80,000	80,000	66,500	70,300
Germany	25,777	29,408	34,634	30,929	31,376	30,591	31,214
France	8,245	7,400	6,600	6,400	6,500	7,300	7,100
Austria-Hungary.	1,276	1,426	1,479	1,200	1,350	1,350	1,400
Italy	2,375	2,980	3,032	2,797	3,000	3,500	3,900
Russia	5,854	6,941	7,533	8,100	8,100	8,800	10,500
Sweden, Norway, etc.	1,500	1,700	2,300	2,500	3,200	9,900	12,200
Chile	19,600	18,000	17,100	19,800	23,400	22,300	20,000
Japan	11,500	11,300	21,000	19,300	20,900	14,400	16,300
Australia	8,100	10,400	16,800	17,400	19,900	18,400	16,000
Japan & Australia.							
Asiatic consumption	8,000	14,100	9,000	10,100	8,000	15,500	15,500
Mexico, Canada etc	10,900	15,500	9,300	9,300	12,200	10,000	13,000
Totals	351,473	418,955	477,978	484,826	499,526	532,700	580,214

WORLD'S CONSUMPTION OF RAW COPPER.

1895-1902.

(Compiled by *Metallgesellschaft & Metallurgische Gesellschaft A.-G.*)

(Metric Tons.)

Country.	1895.	1897.	1899.	1900.	1901.	1902.	1903.
United States	118,835	105,998	188,887	153,900	221,000	203,225	230,200
Great Britain . . .	91,551	109,531	86,528	108,782	105,243	120,576	107,538
Germany	63,813	89,798	97,664	108,927	84,905	101,963	110,142
France	38,174	51,869	49,233	52,626	42,600	52,909	49,276
Austria-Hungary.	12,872	17,193	17,130	19,699	18,358	19,170	19,050
Russia	14,000	19,500	13,800	14,200	14,100	17,500	17,800
Italy	6,641	7,790	7,683	8,345	8,882	10,385	9,834
Belgium	5,000	6,200	5,500	6,250	6,500	6,700	6,100
Netherlands . . .	2,400	2,400	2,400	2,400	2,400	2,400	2,400
Misc. European . .	1,800	2,000	2,000	2,000	2,600	2,900	2,400
Eastern Asia . . .	8,000	14,100	9,000	10,100	8,000	15,500	15,500
Miscellaneous . . .	700	800	900	800	900	1,100	1,800
Totals	364,486	427,579	481,025	488,329	515,788	556,000	572,040

AVERAGE HIGHEST AND LOWEST PRICES OF LAKE COPPER.

Year.	Average Price.	(Cents.)		Highest Price.
		Lowest Price.		
1860.....	22 $\frac{1}{8}$	19 $\frac{3}{4}$	Dec.	24 Jan.
1861.....	22 $\frac{1}{4}$	17 $\frac{1}{2}$	July	27 Dec.
1862.....	21 $\frac{1}{8}$	20 $\frac{3}{4}$	May	32 $\frac{1}{8}$ Nov.
1863.....	33 $\frac{1}{8}$	29	July	38 $\frac{3}{4}$ Dec.
1864.....	47	39	Jan.	55 July
1865.....	39 $\frac{1}{4}$	28	July	50 $\frac{1}{2}$ Jan.
1866.....	34 $\frac{1}{4}$	26 $\frac{1}{2}$	Nov.	42 Jan.
1867.....	25 $\frac{3}{8}$	21 $\frac{1}{2}$	Dec.	29 $\frac{1}{4}$ Jan.
1868.....	23	21 $\frac{1}{2}$	Jan.	24 $\frac{1}{2}$ Dec.
1869.....	24 $\frac{1}{4}$	21 $\frac{1}{2}$	Dec.	27 Feb.
1870.....	21 $\frac{1}{8}$	19	Mch.	23 $\frac{3}{8}$ Nov.
1871.....	24 $\frac{1}{8}$	21 $\frac{1}{4}$	Apr.	27 Dec.
1872.....	35 $\frac{3}{8}$	27 $\frac{1}{8}$	Jan.	44 Apr.
1873.....	28	21	Nov.	35 Jan.
1874.....	22	19	Aug.	25 Jan.
1875.....	22 $\frac{1}{2}$	21 $\frac{1}{2}$	Jan.	23 $\frac{1}{8}$ Sep.
1876.....	21	18 $\frac{3}{4}$	Aug.	23 $\frac{1}{4}$ Jan.
1877.....	19	17 $\frac{1}{2}$	Dec.	20 $\frac{1}{2}$ Feb.
1878.....	16 $\frac{3}{8}$	15 $\frac{1}{2}$	Oct.	17 $\frac{1}{8}$ Jan.
1879.....	18 $\frac{3}{8}$	15 $\frac{1}{2}$	Jan.	21 $\frac{1}{4}$ Nov.
1880.....	21 $\frac{1}{8}$	17 $\frac{7}{8}$	June	25 Jan.
1881.....	18 $\frac{3}{8}$	16	July	20 $\frac{3}{8}$ Dec.
1882.....	19 $\frac{1}{8}$	17 $\frac{7}{8}$	Apr.	20 $\frac{3}{8}$ Jan.
1883.....	16 $\frac{1}{2}$	14 $\frac{7}{8}$	Nov.	18 $\frac{1}{8}$ Jan.
1884.....	13	11	Dec.	15 Dec.
1885.....	10.67	9.8	May	11 $\frac{1}{8}$ Feb.
1886.....	11 $\frac{1}{8}$	10	May	12 $\frac{1}{8}$ Dec.
1887.....	13.85	9.95	May	17 $\frac{3}{4}$ Dec.
1888.....	16.78	15.85	Jan.	17.60 Nov.
1889.....	13.49	11	Sep.	17 $\frac{1}{2}$ Jan.
1890.....	15.60	14	Mch.	17 $\frac{1}{4}$ July
1891.....	12.76	10 $\frac{1}{4}$	Dec.	15 Jan.
1892.....	11.56	10 $\frac{1}{2}$	Feb.	12 $\frac{3}{8}$ Dec.
1893.....	10.75	9.6	Aug.	12 $\frac{1}{2}$ Jan.
1894.....	9.52	9	June	10 $\frac{1}{4}$ Jan.
1895.....	10.73	9 $\frac{3}{8}$	Apr.	12 $\frac{1}{4}$ Aug.
1896.....	10.98	9 $\frac{1}{4}$	Jan.	12 June
1897.....	11.36	10 $\frac{3}{4}$	Nov.	12 Jan.
1898.....	12.05	11	Jan.	13 $\frac{1}{4}$ Dec.
1899.....	17.76	13 $\frac{1}{4}$	Jan.	19 $\frac{3}{8}$ Apr.
1900.....	16.65	16	Feb.	17 $\frac{1}{4}$ Apr.
1901.....	16.72	13	Dec.	17 Jan.
1902.....	12.16	11	Jan.	13 $\frac{1}{2}$ Feb.
1903.....	13.72	12	Dec.	15 $\frac{3}{8}$ Mch.
1904.....	13.01	12 $\frac{1}{2}$	Feb.	15 $\frac{1}{2}$ Nov.

MONTHLY PRICES OF LAKE SUPERIOR INGOT COPPER.

(January-June.)

Year.	January.		February.		March.		April.		May.		June.	
	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.
1860....	24	23½	24	23½	23½	23	23½	23	23½	22½	22½	21½
1861....	20	19	19½	19	19½	19½	19½	19	19½	19½	19	18
1862....	28	27	28	25	25	23	23	21½	21½	20½	23	20½
1863....	35	31	37	35	37	31	31	30	30½	30	30½	30
1864....	41½	39	42	41½	42½	41½	44	42½	44	43	49	44
1865....	50½	46	46	44	44½	34	35	34	34	30	30½	28½
1866....	42	38	38	35½	35½	29½	30	28½	31	29	33	31
1867....	29½	27	27½	27½	27½	24	24½	23½	24½	24	24½	24
1868....	23½	21½	24	22½	24	23½	24½	23½	24½	24	24	23½
1869....	26½	23½	27	26	26½	24	24	23½	24½	23½	23½	22
1870....	22	21½	21½	20½	20½	19	19½	19½	19½	19	20½	19
1871....	22½	22	22½	21½	22	21½	21½	21½	21½	21½	21½	21½
1872....	28½	27½	28½	28½	30½	28½	44	30½	42	36	34½	33
1873....	35	32½	35	34	35	34½	34½	30½	33½	32	31½	29½
1874....	25	24½	25	24½	24½	24	25	24½	25	24½	24½	24½
1875....	23½	21½	22½	21½	21½	21½	21½	21½	23½	22½	23	23
1876....	23½	23	22½	22½	22½	22	22½	22	22½	21	21	19½
1877....	19½	19	20½	19½	19½	19	19½	19½	19½	19	19½	19
1878....	17½	17½	17½	17½	17½	16½	17	16½	16½	16½	16½	16½
1879....	16	15½	15½	15½	15½	15½	16	15½	16½	16	16½	16½
1880....	25	21½	24½	24	24	22½	22½	21	21	18	18½	17½
1881....	19½	19½	19½	19½	19½	19	19	18½	18½	18½	18½	16½
1882....	20½	20½	20	19	19½	18½	18½	17½	18½	18	18½	18
1883....	18½	18	17½	17½	17½	17½	16	15½	16	15½	15½	15
1884....	15	14½	15	14½	15	14½	15	14½	14½	14½	14½	14
1885....	11½	10½	11½	10½	11½	10½	11½	10½	11½	10½	11½	11
1886....	11½	11½	11½	11½	11½	11½	11½	11½	11½	10	10½	10
1887....	12	11½	11½	10½	10½	10½	10½	10	10	9½	10½	10
1888....	17½	15½	16½	16	16½	15½	16½	16	16½	16½	16½	16½
1889....	17½	16½	16½	16½	15½	15	16	15½	12½	12	12½	12
1890....	14½	14½	14½	14½	14½	14	14½	14½	15½	14½	16½	15½
1891....	15	14½	14½	14½	14½	13½	13½	13½	13½	12½	13	12½
1892....	11	10½	10½	10½	12	10½	12	11½	12½	12	11½	11½
1893....	12½	12½	12½	12	12	11½	11½	11½	11½	11	11	10½
1894....	10½	10	10	9½	9½	9½	9½	9½	9½	9½	9½	9
1895....	10	9½	9½	9½	9½	9½	9½	9½	9½	9½	10½	10½
1896....	10½	9½	11½	10	11½	10½	11	10½	11	10½	11½	11½
1897....	12	11½	12	11	11½	11½	11½	11	11½	10½	11½	10½
1898....	11	10½	11½	11½	12	11½	12½	11½	12½	12	11½	11½
1899....	17	13½	18½	17	18	17½	19½	18	19½	18½	18½	17½
1900....	16½	16½	16½	16	17	16½	17½	17	17½	16½	16½	16½
1901....	17	17	17	17	17	17	17	17	17	17	17	17
1902....	11	13	12½	13½	12½	12½	12	12½	12	12½	12½	12½
1903....	12½	12½	13½	12½	15½	13½	15½	14½	15½	14½	15½	14
1904....	13	12½	12½	12½	13	12½	13½	13	13½	13	13½	12½

MONTHLY PRICES OF LAKE SUPERIOR INGOT COPPER.

(July-December.)

Year.	July.		August.		September.		October.		November.		December.	
	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.	Lowest.
1860....	21½	21½	21½	21½	22	21½	22	21½	21½	20½	20½	19½
1861....	18	17½	19	17½	20½	19	20½	20	22½	20½	27	22½
1862....	24½	22½	24½	24	27	24½	32½	27	32½	30½	31½	30½
1863....	32	29	31	29	32½	31	34½	32½	38½	34½	38½	38½
1864....	55	49	52½	50	52½	47½	48	47	49	47	50	48½
1865....	30½	28	32	30½	32½	31½	33	32½	45½	33	45½	39½
1866....	33½	31	31	30	31½	30½	31	30½	30½	26½	29	26½
1867....	26	24	26½	25½	27½	26½	26½	22½	23	22½	23	21½
1868....	24½	23½	24½	24	24	23½	24	23	24	22½	24½	23½
1869....	22½	21½	23½	21½	23	22	22½	22	22½	22	22	21½
1870....	20½	20½	21½	20½	21½	20½	21½	21½	23½	21½	22½	22½
1871....	22½	21½	23	22½	22½	22½	23	23½	24½	23½	27	24½
1872....	34	33	35	32½	35½	33	34½	31½	32½	30½	32½	30½
1873....	29	26½	27½	27	27	25½	25½	24	24	21	25	23
1874....	24½	20	21	19	21½	21	22½	21½	23½	22½	23½	23
1875....	23	22½	23½	23	23½	23½	23½	23	23½	23	23½	23½
1876....	20	19½	19½	18½	21	18½	21½	20½	20½	20	20	19½
1877....	19½	19	19	17½	18½	17½	18	17½	17½	17½	17½	17½
1878....	16½	16	16	16	16½	16	16	15½	15½	15½	16	15½
1879....	16½	16	16½	16	17	16½	21½	18	21½	21	21½	21
1880....	18½	18½	19	19	18½	18½	18½	18½	18½	18½	19½	18½
1881....	16½	16	16½	16½	18½	16½	18½	18	19	18½	20½	19½
1882....	18½	18½	18½	18½	18½	18	18½	18	18½	18	18	17½
1883....	15½	15	15	15	15½	15½	15½	15½	15	14½	15	14½
1884....	14½	13½	14	13½	13½	13	13½	12½	13	12½	12½	11
1885....	11½	10½	11½	11	11½	10½	11½	10½	11½	10½	11½	11½
1886....	10½	10	10½	10	11½	10½	11½	11½	12	11½	12½	11½
1887....	10½	10½	10½	10½	11	10½	12½	10½	14½	11½	17½	14½
1888....	16½	16½	17	16½	17½	16½	17½	17½	17½	17½	17½	17½
1889....	12	12	12	12	12	11	11	11	13½	11½	14½	14
1890....	17½	16½	17½	17	17	17	16½	16½	16½	16½	16	15
1891....	12½	12½	12½	12	12½	12½	12½	11½	11½	11	11½	10½
1892....	11½	11½	11½	11½	11½	11½	11½	11½	12	11½	12½	12½
1893....	10½	10½	10½	9½	9½	9½	9½	9½	10½	9½	10½	10½
1894....	9½	9	9½	9	9½	9½	9½	9½	9½	9½	10	9½
1895....	11½	10½	12½	11½	12½	12	12	11½	11½	11	11	10
1896....	11½	11	11½	10½	10½	10½	10½	10½	11½	10½	11½	11½
1897....	11½	11	11½	11	11½	11½	11½	11	11	10½	11	10½
1898....	11½	11½	12½	11½	12½	12½	11½	12½	11½	12½	12½	12½
1899....	18½	18½	18½	18½	18½	18½	18½	17	17½	17	17	16½
1900....	16½	16½	16½	16½	16½	16½	16½	16½	17	16½	17	16½
1901....	17	16½	16½	16½	16½	16½	16½	16½	16½	16½	17	13
1902....	12	12½	11½	12½	11½	12½	11½	12½	11½	12	11½	12
1903....	14½	13	13½	13	13½	13½	14	13	13½	12½	12½	12
1904....	12½	12½	12½	12½	13	12½	14	12½	15½	13½	15½	14½

- AVERAGE AMERICAN AND ENGLISH PRICES.

The following table of average annual prices of copper in England and the United States is based upon the New York price for Lake copper and the London price for Standard copper. The last two columns give the American prices in cents and fractions and the English equivalent in sterling. English prices are for long tons of 2,240 pounds, and American prices for pounds avoirdupois, the last column, giving English equivalent of the American prices, being figured in long tons.

Year.	English Prices.				American Prices.—	
	Lowest. £ s. d.	Highest. £ s. d.	Fluctuation. £ s. d.	Average. £ s. d.	Average Cents.	Average. £ s. d.
1880....	54 10 0	74 0 0	10 10 0	62 14 7	21 $\frac{7}{8}$	99 0 8
1881....	57 0 0	72 10 0	15 10 0	61 16 9	18 $\frac{3}{4}$	84 0 8
1882....	63 0 0	71 10 0	8 10 0	66 10 5	19 $\frac{1}{2}$	88 6 11
1883....	57 0 0	67 10 0	9 10 0	62 17 11	16 $\frac{1}{2}$	76 3 7
1884....	47 5 0	58 0 0	10 15 0	53 17 6	13	59 19 0
1885....	38 10 0	61 12 6	23 2 6	43 11 0	10.67	49 6 5
1886....	38 10 0	43 15 0	5 5 0	40 1 8	11 $\frac{1}{4}$	51 1 10
1887....	38 7 6	85 5 0	46 17 6	46 0 6	13.85	64 0 0
1888....	73 0 0	105 0 0	32 0 0	81 11 3	16.78	77 10 1
1889....	35 0 0	80 0 0	45 0 0	49 14 8	13.49	62 6 5
1890....	46 10 0	61 12 6	15 2 6	54 5 3	15.60	72 1 10
1891....	44 1 3	56 10 0	12 8 9	51 9 4	12.76	58 19 1
1892....	43 10 0	47 18 9	4 8 9	45 13 2	11.56	53 8. 4
1893....	40 12 6	46 16 3	6 3 9	43 15 6	10.75	49 13 10
1894....	37 17 6	43 0 0	5 2 6	40 7 4	9.52	44 0 0
1895....	38 13 9	47 8 9	8 15 0	42 19 7	10.73	49 12 0
1896....	40 10 0	50 8 9	9 18 9	46 18 1	10.98	50 14 9
1897....	47 0 0	51 15 0	4 15 0	49 2 6	11.36	52 10 2
1898....	49 5 0	57 8 9	8 3 9	51 16 7	12.05	55 13 10
1899....	58 1 3	79 2 6	21 1 3	73 13 9	17.76	82 0 11
1900....	70 14 2	78 7 1	7 12 11	73 12 6	16.65	76 18 2
1901....	47 0 0	72 17 6	25 17 6	66 19 8	16.72	77 4 7
1902....	47 10 0	56 15 0	9 5 0	52 11 5	12.16	56 3 8
1903....	53 13 7	64 0 7	10 7 0	58 3 2	13.72	63 4 8
1904....	55 5 0	68 7 6	13 2 6	62 12 2	13.01	60 2 6

PRICE OF ELECTROLYTIC WIRE-BARS.

The following table gives the average monthly prices of electrolytic wire-bars, on the New York Metal Exchange, for 5 years, 1900 to 1904, inclusive:

(Cents.)

Month.	1900.	1901.	1902.	1903.	1904.
January.	16.250	16.625	11.550	12.260	12.670
February.	16.250	16.625	12.500	12.885	12.415
March.....	16.250	16.625	12.210	14.510	12.640
April.....	16.875	16.625	11.975	14.890	13.185
May	16.750	16.625	11.990	14.875	13.080
June	16.250	16.625	12.110	14.640	12.650
July	16.250	16.600	11.900	13.700	12.675
August.	16.375	16.600	11.545	13.375	12.630
September.	16.500	16.500	11.600	13.660	12.700
October	16.625	16.500	11.590	13.260	13.140
November	16.625	16.500	11.415	13.150	14.425
December	16.625	14.800	11.475	12.290	14.890

TABLE FOR REDUCING ENGLISH INTO AMERICAN PRICES.

The following table shows the corresponding value in cents and fractions, per pound, of copper quoted at various prices from £35—the lowest quotation ever made—to £99 per long ton, exchange being figured on the basis of \$4.85 as equal to one pound sterling:

£36.... 7.79c.	£52.... 11.25c.	£68.... 14.72c.	£84.... 18.18c.
£37.... 8.01c.	£53.... 11.47c.	£69.... 14.93c.	£85.... 18.40c.
£38.... 8.22c.	£54.... 11.69c.	£70.... 15.15c.	£86.... 18.62c.
£39.... 8.44c.	£55.... 11.90c.	£71.... 15.37c.	£87.... 18.83c.
£40.... 8.66c.	£56.... 12.12c.	£72.... 15.58c.	£88.... 19.05c.
£41.... 8.87c.	£57.... 12.34c.	£73.... 15.80c.	£89.... 19.27c.
£42.... 9.09c.	£58.... 12.55c.	£74.... 16.02c.	£90.... 19.48c.
£43.... 9.31c.	£59.... 12.77c.	£75.... 16.23c.	£91.... 19.70c.
£44.... 9.52c.	£60.... 12.99c.	£76.... 16.45c.	£92.... 19.92c.
£45.... 9.74c.	£61.... 13.20c.	£77.... 16.67c.	£93.... 20.13c.
£46.... 9.95c.	£62.... 13.42c.	£78.... 16.88c.	£94.... 20.35c.
£47.... 10.17c.	£63.... 13.64c.	£79.... 17.10c.	£95.... 20.56c.
£48.... 10.39c.	£64.... 13.85c.	£80.... 17.32c.	£96.... 20.78c.
£49.... 10.60c.	£65.... 14.07c.	£81.... 17.53c.	£97.... 21.00c.
£50.... 10.82c.	£66.... 14.29c.	£82.... 17.75c.	£98.... 21.21c.
£51.... 11.04c.	£67.... 14.50c.	£83.... 17.97c.	£99.... 21.43c.

PROPORTION OF COPPER TO TOTAL VALUE AMERICAN METAL
PRODUCTION.

1888-1901.

Year.	Total Value Metallic Products.	Total Value of Copper Production.	Production of Copper in Pounds.	Percentage Copper Values.
1888.....	\$253,731,822	\$ 33,833,954	231,270,622	13.3
1889.....	267,247,033	26,907,809	231,246,214	10.0
1890.....	305,735,670	30,848,797	265,115,133	10.1
1891.....	300,232,798	38,455,300	295,812,076	12.1
1892.....	307,936,189	37,977,142	352,971,744	12.3
1893.....	250,207,406	32,054,601	339,785,972	12.8
1894.....	218,382,494	33,141,142	364,866,808	15.2
1895.....	282,149,808	38,682,347	392,639,964	13.8
1896.....	287,860,155	49,456,603	460,061,430	17.2
1897.....	302,531,147	54,080,180	494,078,274	17.9
1898.....	343,748,268	61,865,276	526,375,591	18.0
1899.....	525,797,557	101,222,712	581,319,091	19.0
1900.....	550,425,286	98,494,039	602,808,839	17.9
1901.....	524,873,284	86,629,266	601,499,886	16.5
1902.....	642,258,584	76,568,954	659,508,644	11.9
1903.....	624,318,008	91,506,006	698,044,517	15.3

PRICES AND SALES OF AMERICAN COPPER SHARES.

Company.	1903.			1904.		
	Highest.	Lowest.	Sales.	Highest.	Lowest.	Sales.
Adventure.	\$18.00	\$ 2.00	50,070	\$ 7.87	\$ 1.75	55,094
Allouez.....	7.50	3.13	152,262	21.00	3.37	258,301
Amalgamated.	79.50	35.50	1,717,341	82.75	43.13	.....
Anaconda.	31.12	15.63	7,791	29.75	15.37	.....
Arcadian.	6.13	.75	92,842	3.00	.25	30,208
Arnold.....	.95	.25	4,582	1.50	.16	.....
Atlantic.	15.00	7.00	34,087	22.25	7.00	126,120
Bingham.	39.00	20.00	126,200	38.75	19.00	257,516
Boston Cons. ....	.....	.....	.....	7.87	6.12	126,859
British Columbia. .	7.50	2.50	2,018	3.75	3.25	.....
Calumet & Hecla..	550.00	400.00	5,371	700.00	435.00	4,395
Centennial.	31.75	12.00	301,086	33.00	14.63	202,483
Copper Range.	75.00	37.00	1,226,030	74.50	38.00	684,467
Daly-West.	48.56	30.50	46,749	36.50	11.63	106,904
Elm River.	5.38	2.00	67,078	4.00	1.75	.....
Franklin.....	14.00	6.75	23,377	15.00	7.87	37,315
Granby.....	5.25	3.63	53,639	5.88	3.00	436,287
Isle Royale.	17.50	5.00	44,485	35.50	7.00	206,101
Mass.	18.00	3.00	65,717	10.00	3.00	59,746
Mayflower.....	2.50	.50	15,634	2.00	.45	.....
Michigan.....	11.50	4.50	29,087	11.00	4.25	48,159
Mohawk.	58.00	31.00	120,526	57.75	34.12	111,480
Montreal & Boston	2.88	.55	88,432	1.62	.40	.....
National.....	1.25	.75	820	2.00	.40	.....
Old Colony.	2.50	.50	20,106	2.50	.87	15,723
Old Dominion.	23.50	3.75	119,849	29.00	9.00	136,134
Osceola.....	79.00	43.00	83,419	98.00	53.00	77,537
Parrot.	34.00	16.00	59,512	33.50	21.00	72,217
Phoenix.	7.50	2.75	23,522	5.00	.50	.....
Quincy.	126.50	80.00	6,438	125.00	80.00	10,023
Rhode Island.	3.75	.75	15,815	3.00	1.00	11,594
Santa Fe.	3.00	1.00	42,370	3.50	1.12	.....
Shannon.....	15.00	7.00	133,571	10.50	6.50	555,011
Tamarack.	189.50	75.00	15,239	140.00	94.00	10,236
Tecumseh.	1.80	.40	7,505	4.25	.25	.....
Tennessee.	33.00	17.25	11,030	43.25	30.00	.....
Trinity.	14.00	4.00	135,573	18.50	4.63	337,510
United Copper.	32.75	4.00	6,520	7.00	6.00	.....
United States. ....	.....	.....	.....	28.75	19.75	633,140
Utah Cons.	33.63	22.00	400,247	47.00	30.00	1,553,158
Victoria.	9.00	1.50	52,925	6.37	2.12	.....
Washington.....	.50	.15	2,240	1.00	.10	.....
Winona.	13.50	5.50	181,253	13.50	5.00	93,029
Wolverine.	77.00	54.00	28,794	110.00	68.00	20,899
Wyandot.	2.88	.75	54,552	3.00	.50	.....

DIVIDENDS OF AMERICAN COPPER MINES.

Company.	1902.	1903.	1904.	Total.
Aberdeen.	\$.....	\$.....	\$.....	\$ 32,175
Anaconda.	1,200,000	1,200,000	1,200,000	24,450,000
Arizona.	1,115,000	1,003,000	821,000	5,269,596
Atlantic. ....	.....	.....	.....	940,000
Boston & Montana. ..	900,000	1,200,000	10,220,000	38,525,000
Butler-Liberal. ....	.....	2,500	.....	2,500
Butte & Boston. ....	.....	.....	200,000	1,800,000
Calumet & Arizona. ..	.....	400,000	1,300,000	1,700,000
Calumet & Hecla.	2,500,000	3,500,000	4,000,000	87,350,000
Carisa. ....	.....	.....	.....	30,000
Centennial-Eureka. ....	.....	.....	100,000	2,767,700
Central. ....	.....	.....	.....	1,970,000
Champion. ....	.....	300,000	200,000	500,000
Cliff. ....	.....	.....	.....	2,518,620
Colusa-Parrot. ....	.....	.....	.....	1,440,000
Copper Falls. ....	.....	.....	.....	100,000
Dalton & Lark. ....	.....	.....	.....	350,000
Daly-West.	864,000	1,334,000	1,044,000	4,641,000
Ducktown. ....	.....	.....	.....	240,500
Ferris-Haggarty. ....	.....	.....	.....	15,000
Franklin. ....	.....	.....	.....	1,240,000
Granby. ....	.....	133,630	.....	133,630
Greene Cons. ....	.....	431,820	1,123,200	1,775,020
Horn Silver. ....	.....	20,000	80,000	5,442,000
Le Roi No. 2. ....	.....	.....	58,000	345,600
Mammoth. ....	.....	60,000	120,000	1,980,000
Minnesota. ....	.....	.....	.....	1,820,000
Montana Ore Pchg. Co.	324,000	648,000	486,000	3,780,000
Mountain Copper.	539,500	143,000	.....	3,776,250
National. ....	.....	.....	.....	320,000
Osceola. ....	.....	.....	192,300	4,439,600
Parrott.	115,000	.....	230,000	6,002,785
Pewabic. ....	.....	.....	.....	1,000,000
Phoenix. ....	.....	.....	.....	20,000
Pride of the West.	15,000	.....	.....	15,000
Quincy (Mich).	700,000	550,000	500,000	14,970,000
Quincy (Utah).	234,000	.....	.....	959,375
Red Bird. ....	.....	36,000	36,000	72,000
Ridge. ....	.....	.....	.....	100,000
Standard. ....	.....	40,000	.....	40,000
Tamarack. ....	.....	.....	90,000	8,580,000
Tennessee. ....	.....	218,750	218,750	437,500
Trimountain. ....	.....	300,000	.....	300,000
Tyee. ....	.....	.....	136,800	136,800
United Verde.	1,800,000	2,025,000	1,557,000	26,980,680
Utah Cons. ....	.....	954,000	900,000	2,586,000
Wolverine.	240,000	330,000	450,000	1,770,000
Totals.	10,546,500	14,829,700	25,251,050	263,624,325
Amalgamated.	3,847,000	3,078,000	3,078,000	25,812,127
United.	150,000	300,000	300,000	750,000
Grand Totals.	\$14,543,500	\$18,207,700	\$28,629,050	\$290,186,452

DIVIDENDS OF LAKE SUPERIOR MINES.

1849-1872.

	1849.	1850.	1851.	1852.
Cliff	\$ 60,000	\$ 84,000	\$ 60,000	\$ 60,000
Totals.....	\$ 60,000	\$ 84,000	\$ 60,000	\$ 60,000
	1853.	1854.	1855.	1856.
Cliff	\$ 90,000	\$ 108,000	\$ 78,000	\$ 180,000
Minnesota.....		90,000	90,000	200,000
Totals.....	\$ 90,000	\$ 198,000	\$ 168,000	\$ 380,000
	1857.	1858.	1859.	1860.
Cliff	\$ 180,000	\$ 160,000	\$ 180,000	\$
Minnesota.....	300,000	300,000	180,000	120,000
Totals.....	\$ 480,000	\$ 460,000	\$ 360,000	\$ 120,000
	1861.	1862.	1863.	1864.
Cliff	\$ 80,000	\$ 80,000	\$ 180,000	\$ 320,000
Minnesota.....	100,000	160,000	160,000	60,000
National.....	80,000	80,000	.....	80,000
Pewabic.....	.....	60,000	120,000	200,000
Quincy.....	.....	60,000	200,000	280,000
Franklin.....	.....	.....	60,000	100,000
Central.....	.....	.....	.....	50,000
Copper Falls.....	.....	.....	.....	60,000
Totals.....	\$ 260,000	\$ 440,000	\$ 720,000	\$1,150,000
	1865.	1866.	1867.	1868.
Cliff	\$ 200,000	\$ 120,000	\$ 60,000	\$
National.....	40,000	.....	.....	.....
Quincy.....	160,000	.....	.....	60,000
Franklin.....	60,000	.....	.....	.....
Central.....	50,000	50,000	50,000	40,000
Totals.....	\$ 510,000	\$ 170,000	\$ 110,000	\$ 100,000
	1869.	1870.	1871.	1872.
Cliff	\$	\$	\$ 100,000	\$ 100,000
Minnesota.....	.....	.....	.....	50,000
National.....	.....	.....	20,000	20,000
Pewabic.....	.....	.....	20,000	40,000
Quincy.....	40,000	120,000	140,000	350,000
Franklin.....	.....	.....	20,000	40,000
Central.....	70,000	80,000	50,000	80,000
Copper Falls.....	.....	.....	40,000	.....
Hecla.....	100,000	300,000	250,000	.....
Calumet.....	.....	200,000	100,000	.....
Calumet & Hecla...	.....	.....	900,000	2,400,000
Totals.....	\$ 210,000	\$ 700,000	\$1,640,000	\$3,080,000

DIVIDENDS OF LAKE SUPERIOR MINES. (Continued.)

1873-1888.

	1873.	1874.	1875.	1876.
Minnesota.....	\$	\$	\$	\$ 10,000
Pewabic	20,000	.....	.....	.....
Quincy	100,000	160,000	220,000	160,000
Central	160,000	160,000	80,000	100,000
Calumet & Hecla ...	2,000,000	1,600,000	1,600,000	1,600,000
Ridge.....	50,000	20,000	20,000	.....
Totals	\$2,330,000	\$1,940,000	\$1,920,000	\$1,870,000

	1877.	1878.	1879.	1880.
Cliff	\$	\$	\$ 38,620	\$
Quincy	80,000	100,000	40,000	220,000
Central	140,000	100,000	80,000	100,000
Calumet & Hecla ...	1,600,000	1,600,000	1,600,000	2,500,000
Ridge.....	.....	.....	.....	10,000
Phoenix.....	20,000	.....	.....	.....
Atlantic.....	.....	20,000	.....	40,000
Osceola .....	.....	40,000	60,000	210,000
Totals	\$1,840,000	\$1,860,000	\$1,818,620	\$3,080,000

	1881.	1882.	1883.	1884.
Quincy	\$ 320,000	\$ 520,000	\$ 380,000	\$ 280,000
Franklin .....	.....	.....	.....	80,000
Central	120,000	50,000	60,000	40,000
Calumet & Hecla ...	2,000,000	2,000,000	2,000,000	800,000
Atlantic.....	.....	80,000	80,000	40,000
Osceola	225,000	200,000	150,000	87,500
Totals	\$2,665,000	\$2,850,000	\$2,670,000	\$1,327,500

	1885.	1886.	1887.	1888.
Quincy	\$ 180,000	\$ 240,000	\$ 200,000	\$ 360,000
Franklin	40,000	80,000	40,000	120,000
Central	30,000	40,000	40,000	70,000
Calumet & Hecla ...	1,700,000	1,500,000	1,000,000	2,000,000
Atlantic.....	20,000	40,000	40,000	120,000
Osceola .....	.....	.....	50,000	150,000
Tamarack .....	.....	.....	.....	440,000
Totals	\$1,970,000	\$1,900,000	\$1,370,000	\$3,260,000

DIVIDENDS OF LAKE SUPERIOR MINES. (Continued.)

1889-1904.

	1889.	1890.	1891.	1892.
Quincy	\$ 280,000	\$ 320,000	\$ 450,000	\$ 350,000
Franklin	80,000	80,000	80,000	160,000
Central	40,000	20,000	20,000	.....
Calumet & Hecla ...	1,500,000	2,000,000	2,000,000	2,000,000
Atlantic	80,000	100,000	40,000	.....
Osceola	50,000	225,000	150,000	150,000
Tamarack	640,000	590,000	800,000	600,000
Kearsarge .....	.....	80,000	.....	.....
Totals	\$2,670,000	\$3,415,000	\$3,540,000	\$3,280,000

	1893.	1894.	1895.	1896.
Pewabic	\$ 400,000	\$?	\$ 140,000	\$
Quincy	300,000	400,000	600,000	1,000,000
Franklin	120,000	80,000	.....	.....
Calumet & Hecla ...	2,000,000	1,500,000	2,000,000	2,500,000
Osceola	100,000	.....	100,000	125,000
Tamarack	600,000	400,000	400,000	360,000
Kearsarge .....	.....	.....	40,000	.....
Totals	\$3,520,000	\$2,380,000	\$3,280,000	\$3,985,000

	1897.	1898.	1899.	1900.
Quincy	\$ 800,000	\$1,000,000	\$ 950,000	\$ 900,000
Calumet & Hecla ...	4,000,000	5,000,000	10,000,000	7,000,000
Atlantic	40,000	40,000	.....	80,000
Osceola	191,000	277,250	558,450	571,200
Tamarack	360,000	480,000	600,000	1,020,000
Kearsarge	40,000	.....	.....	.....
Wolverine .....	.....	60,000	210,000	240,000
Totals	\$5,431,000	\$6,857,250	\$12,318,450	\$9,811,200

	1901.	1902.	1903.	1904.
Quincy	\$ 900,000	\$ 700,000	\$ 550,000	\$ 500,000
Calumet & Hecla ...	4,500,000	2,500,000	3,500,000	4,000,000
Atlantic	80,000	.....	.....	.....
Osceola	576,900	.....	.....	192,300
Tamarack	1,200,000	.....	.....	90,000
Wolverine	240,000	240,000	330,000	450,000
Champion .....	.....	.....	300,000	200,000
Trimountain .....	.....	.....	300,000	.....
Totals	7,496,900	3,440,000	4,980,000	\$5,432,300

LAKE SUPERIOR MINE DIVIDENDS.

TOTALS BY MINES, FOR ALL YEARS.					
Company.	Condition.	First.	Last.	Total.	Amount.
Atlantic.....	<i>a</i>	1878	1901	18	\$ 940,000
Cliff.....	<i>h</i>	1849	1867	37	2,518,620
Central.....	<i>b</i>	1864	1891	30	1,970,000
Copper Falls.....	<i>b</i>	1864	1871	3	100,000
Calumet.....	<i>c</i>	1870	1871	3	300,000
Calumet & Hecla.....	<i>a</i>	1871	1904	128	86,400,000
Champion.....	<i>a</i>	1903	1904	5	500,000
Franklin.....	<i>a</i>	1863	1894	21	1,240,000
Hecla.....	<i>c</i>	1869	1871	7	650,000
Kearsarge.....	<i>d</i>	1890	1897	3	160,000
Minnesota.....	<i>e</i>	1854	1876	19	1,820,000
National.....	<i>b</i>	1861	1872	9	320,000
Osceola.....	<i>a</i>	1878	1904	54	4,439,600
Pewabic.....	<i>f</i>	1862	1873	11	1,000,000
Phoenix.....	<i>a</i>	1877	1877	1	20,000
Quincy.....	<i>a</i>	1862	1903	77	14,970,000
Ridge.....	<i>g</i>	1873	1880	4	100,000
Tamarack.....	<i>a</i>	1888	1901	37	8,580,000
Trimountain.....	<i>a</i>	1903	1903	2	300,000
Wolverine.....	<i>a</i>	1898	1903	11	1,770,000
Totals.....				470	128,098,220

*a. Active.**b. Idle.**c. Absorbed by Calumet & Hecla.**d. Absorbed by Osceola.**e. Absorbed by Michigan.**f. Absorbed by Quincy.**g. Absorbed by Mass.**h. Absorbed by Tamarack.*

ASSESSMENTS OF LAKE SUPERIOR MINES.

Company.	1897.	1898.	1899.	1900.
Adventure.....	\$.....	\$.....	\$.....	\$200,000
Alouez.....		80,000		
Arnold.....		180,000	180,000	
Baltic.....	100,000	100,000	300,000	
Centennial.....	120,000	270,000		270,000
Copper Range.....				300,000
Humboldt.....	20,000			
Mass.....				200,000
Mohawk.....				250,000
National.....		200,000		
Tecumseh.....	40,000			
Trimountain.....				300,000
Union.....	50,000			
Washington.....		8,000		
Totals.....	\$330,000	\$838,000	\$480,000	\$1,520,000

ASSESSMENTS OF LAKE SUPERIOR MINES.—Continued.

Company.	1901.	1902.	1903.	1904.
Adventure.....	\$700,000	\$200,000	\$200,000	\$ 50,000
Allouez.....	300,000	.....	.....	300,000
Baltic.....	300,000	.....	.....	.....
Centennial.....	180,000	.....	.....	360,000
Mass.....	500,000	100,000	100,000	100,000
Michigan.....	100,000	200,000	300,000	.....
Mohawk.....	300,000	300,000	200,000	.....
Old Colony.....	.....	.....	100,000	.....
Phoenix.....	.....	100,000	100,000	100,000
Rhode Island.....	.....	100,000	.....	.....
Tecumseh.....	55,000	.....	.....	.....
Trimountain.....	200,000	300,000	.....	.....
Victoria.....	.....	200,000	100,000	.....
Winona.....	.....	100,000	100,000	.....
Wyandot.....	.....	.....	.....	100,000
Totals.....	\$2,635,000	\$1,600,000	\$1,200,000	\$1,010,000

DIVIDENDS AND ASSESSMENTS OF LAKE SUPERIOR MINES.

Name of Company.	Total Assessments.	Total Dividends.	Credit Balance.	Debit Balance.
Adventure Cons....	\$1,850,000	\$.....	\$.....	\$1,850,000
Albany & Boston..	840,000	.....	.....	840,000
Allouez.....	2,225,000	.....	.....	2,225,000
Atlantic.....	980,000	940,000	.....	40,000
Arcadian.....	1,800,000	.....	.....	1,800,000
Arnold.....	810,000	.....	.....	810,000
Aztec.....	150,000	.....	.....	150,000
Baltic.....	1,800,000	.....	.....	1,800,000
Belt.....	1,300,000	.....	.....	1,300,000
Bohemian.....	180,000	.....	.....	180,000
Caledonia.....	140,000	.....	.....	140,000
Calumet & Hecla .	1,200,000	87,350,000	86,150,000	.....
Centennial (Old)...	1,135,000	.....	.....	1,135,000
Centennial (New)...	1,510,000	.....	.....	1,510,000
Central.....	100,000	1,970,000	1,870,000	.....
Champion.....	2,500,000	500,000	.....	2,000,000
Cliff.....	111,000	2,518,620	2,407,620	.....
Conglomerate.....	1,300,000	.....	.....	1,300,000
Copper Falls.....	1,000,000	100,000	.....	900,000
Copper Range.....	2,300,000	.....	.....	2,300,000
Delaware.....	2,000,000	.....	.....	2,000,000
Elm River.....	1,200,000	.....	.....	1,200,000
Evergreen Bluff ..	225,000	.....	.....	225,000
Flint Steel.....	264,000	.....	.....	264,000
Forest.....	180,000	.....	.....	180,000
Franklin.....	220,000	1,240,000	1,020,000	.....
Humboldt.....	120,000	.....	.....	120,000
Huron.....	240,000	.....	.....	240,000
Indiana ..	200,000	.....	.....	200,000
Isle Royale.....	2,000,000	.....	.....	2,000,000
Kearsage.....	180,000	160,000	.....	20,000
Mass Cons.....	1,800,000	.....	.....	1,800,000

DIVIDENDS AND ASSESSMENTS OF LAKE SUPERIOR MINES.

(Continued.)

Name of Company.	Total Assessments.	Total Dividends.	Credit Balance.	Debit Balance.
Mayflower.....	800,000	.....	.....	800,000
Michigan	1,600,000	.....	.....	1,600,000
Miners'	2,000,000	.....	.....	2,000,000
Mohawk.	2,100,000	.....	.....	2,100,000
Minnesota	456,000	1,820,000	1,364,000	.....
National.....	320,000	320,000	.....	.....
Nonesuch.	400,000	.....	.....	400,000
Northwest.	283,000	.....	.....	283,000
Norwich.	230,000	.....	.....	230,000
Ohio Trap Rock...	150,000	.....	.....	150,000
Old Colony	1,100,000	.....	.....	1,100,000
Osceola	1,700,000	4,439,600	2,739,600	.....
Pennsylvania....	126,000	.....	.....	126,000
Peninsula.....	400,000	.....	.....	400,000
Pewabec.....	585,200	1,000,000	414,800	.....
Phoenix (Old)....	1,037,500	29,000	.....	1,017,500
Phoenix Cons....	1,200,000	.....	.....	1,200,000
Quincy.	200,000	14,970,000	14,770,000	.....
Ridge... ..	470,000	100,000	.....	370,000
Rhode Island	900,000	.....	.....	900,000
Tamarack	320,000	8,580,000	8,260,000	.....
Tamarack Junior .	640,000	.....	.....	640,000
Tecumseh	500,000	.....	.....	500,000
Trimountain.....	1,900,000	300,000	.....	1,600,000
Toltec.....	500,000	.....	.....	500,000
Victoria	1,000,000	.....	.....	1,000,000
Winona	1,000,000	.....	.....	1,000,000
Wolverine	230,000	1,770,000	1,540,000	.....
Wyandot.	800,000	.....	.....	800,000
Totals.....	54,807,700	\$128,098,220	120,437,220	47,445,500
Balance .....	.....	.....	72,991,720	.....

CAPITALIZATION OF LAKE COPPER COMPANIES.

The following table shows number of shares authorized, number issued, and total capitalization of active Lake Superior copper mining corporations:

Name of Company.	Organized Under laws of	No. shares authorized.	No. shares issued.	Gross Capitalisa- tion.
Adventure Cons.....	Mich.	100,000	100,000	\$2,500,000
Allouez.....	Mich.	100,000	100,000	2,500,000
Arcadian	N. J.	150,000	150,000	3,750,000
Arnold.....	Mich.	100,000	100,000	2,500,000
Atlantic.	Mich.	100,000	100,000	2,500,000
Ashbed.....	Mich.	40,000	40,000	1,000,000
Calumet & Hecla.....	Mich.	100,000	100,000	2,500,000
Centennial.	Mich.	100,000	90,000	2,500,000
Central.	Mich.	20,000	20,000	500,000
Copper Range.	Mich.	100,000	100,000	2,500,000
Copper Range Cons.	N. J.	385,000	385,000	38,500,000
Champion	Mich.	100,000	100,000	2,500,000
Elm River.....	N. J.	100,000	100,000	2,500,000
Franklin.....	Mich.	100,000	100,000	2,500,000
Humboldt.....	Mich.	40,000	40,000	1,000,000
Isle Royale	N. J.	150,000	150,000	3,750,000
Mohawk.	Mich.	100,000	100,000	2,500,000
Mayflower.....	Mich.	100,000	100,000	2,500,000
Mass Consolidated.....	Mich.	100,000	100,000	2,500,000
Michigan	Mich.	100,000	100,000	2,500,000
National.....	Mich.	100,000	40,000	2,500,000
Old Colony	Mich.	100,000	100,000	2,500,000
Osceola Consolidated. ...	Mich.	100,000	96,150	2,500,000
Phoenix.....	Mich.	100,000	100,000	2,500,000
Quincy.	Mich.	100,000	100,000	2,500,000
Rhode Island	Mich.	100,000	100,000	2,500,000
St. Mary's Mineral L'd Co	N. J.	200,000	140,000	5,000,000
Tamarack	Mich.	60,000	60,000	1,500,000
Tecumseh	Mich.	100,000	40,000	2,500,000
Trimountain.....	Mich.	100,000	100,000	2,500,000
Union C. L. & M. Co. ...	Mich.	100,000	80,000	2,500,000
Victoria.....	Mich.	100,000	100,000	2,500,000
Winona	Mich.	100,000	100,000	2,500,000
Washington.....	Mich.	100,000	60,000	2,500,000
Wolverine	Mich.	60,000	60,000	1,500,000
Wyandot.	Mich.	100,000	100,000	2,500,000

Total capitalization. \$124,000,000

FORCES EMPLOYED BY MINES.

Year.	Michigan.			Montana.		
	Number of Employees.	Number of Fatalities.	Percentage Fatalities.	Number of Employees.	Number of Fatalities.	Percentage Fatalities.
1889...	6,480	21	.30	....	..	...
1890...	7,310	35	.48	....	..	...
1891...	7,702	28	.36	....	..	...
1892...	7,640	21	.27	....	..	...
1893...	7,591	23	.30	....	..	...
1894...	7,348	22	.30	....	..	...
1895...	7,249	46	.63	....	..	...
1896...	8,170	19	.23	....	..	...
1897...	8,726	26	.30	....	..	...
1898...	10,469	23	.22	6,548	..	...
1899...	13,051	27	.20	6,932	..	...
1900...	13,971	36	.25	6,929	30	.43
1901...	13,498	33	.24	....	..	...
1902...	14,130	44	.31	8,100	33	.41
1903...	15,196	37	.24	....	..	...

NUMBER OF SHAREHOLDERS IN LAKE COPPER COMPANIES.

Company.	1896.	1898.	1899.	1900.	1901.	1902.	1903.	1904.
Calumet & Hecla...	2,464	2,716	2,859	3,080	3,413	3,425	3,310	3,258
Osceola.....	823	1,477	1,522	1,512	1,793	1,985	1,988	2,089
Quincy.....	978	1,445	1,449	1,540	1,477	1,557	1,612	1,657
Franklin.....	458	442	550	945	1,037	1,311	1,438	1,429
Rhode Island.....	....	....	97	1,100	1,256	1,216	1,316	1,339
Victoria.....	....	....	....	796	1,001	1,206	1,275	1,324
Wolverine.....	333	625	688	892	1,099	1,223	1,262	1,292
Tamarack.....	1,178	1,353	1,157	1,169	1,241	1,286	1,239	1,136
Adventure.....	....	....	431	1,046	1,288	1,050	1,089	1,283
Mohawk.....	....	....	61	594	940	951	1,001	1,076
Michigan.....	....	....	22	592	775	933	980	937
Winona.....	....	....	468	637	736	909	854	878
Old Colony.....	....	....	....	598	626	721	746	747
Centennial.....	....	438	337	439	550	597	630	636
Allouez.....	....	....	449	465	510	554	627	726
Phoenix.....	....	....	....	352	408	582	612	642
Mayflower.....	....	....	....	399	423	587	587	594
Elm River.....	....	....	....	....	....	....	506	562
Atlantic.....	364	401	300	374	408	417	457	633
Trimountain.....	....	....	....	780	882	730	335	41
Central.....	....	....	196	203	220	189	168	224
Ahmeek.....	....	....	....	....	....	....	....	114
Seneca.....	....	....	....	....	....	....	....	69
Baltic.....	....	....	486	513	582	177	17	10
Copper Range.....	....	....	....	....	....	121	11	10
Champion.....	....	....	....	....	....	8	8	8
Totals.....	6,598	8,897	11,072	18,026	20,665	21,735	22,068	22,714

FUTURE PRODUCTION OF COPPER.

1901-2000.

The safest guide to the future is the history of the past. In the following tables an effort is made to estimate the probable production of copper for the future, basing such estimates upon the outputs of the past. The preliminary table next following gives a summary of the production of the Nineteenth Century, by decades, with percentages of increase for each decade:

Decade.	Total Production.	Yearly Average.	Percentage of Increase.
1801-1810.....	91,000	9,100	.....
1811-1820.....	96,000	9,600	5.60
1821-1830.....	135,000	13,500	40.62
1831-1840.....	218,400	21,840	61.77
1841-1850.....	291,000	29,100	33.24
1851-1860.....	506,999	50,699	74.22
1861-1870.....	900,000	90,000	77.51
1871-1880.....	1,189,000	118,900	32.11
1881-1890.....	2,373,398	237,339	99.44
1891-1900.....	3,708,901	370,890	56.22

Analysis of these figures shows that the average decennial percentage of increase for the century was 53.91%; for the last half of the century, 67.90%, and for the last twenty years, during which the electrical industry became a great consumer of copper, the average decennial increase in copper output was 77.83%. Measured by decades the increase in copper production during the Nineteenth Century was forty-fold, from the first decennium to the last, while measured by years, and estimating the production of 1801 at 9,000 tons, the production of 1900, which amounted to 486,363 tons, was just fifty-fold as great as one hundred years earlier. A fifty-fold increase in production during the present century would give an output of 24,318,150 tons of copper for the year 2000.

The actual annual percentage of increase for the Nineteenth Century was a very small fraction more than 4%, measuring outputs by decades, and a fraction over 4%, measuring annual products from 1801 to 1900, inclusive. In order to show the actual increase in production by decades, as compared with the theoretical increase at 4% yearly, the appended table is given, 4% being figured as equal to 50% increase in 10 years, though actually but 48.02%.

Year.	(Long Tons.) Actual Average.	Theoretical Average.
1810.....	9,100	9,000
1820.....	9,600	13,500
1830.....	13,500	19,750
1840.....	21,840	29,625
1850.....	29,100	44,437
1860.....	50,699	66,656
1870.....	90,000	99,984
1880.....	118,900	149,992
1890.....	237,339	224,964
1900.....	370,890	337,447

The foregoing table shows very plainly the effect of electrical demand for the metal, which first became a factor of importance in the ninth decade, shortly after 1880. Previous to that decade the theoretical increase of 4% annually, compounded, exceeds the actual increase in every decade, but after 1880 the actual increase exceeds the theoretical ratio. The actual copper output of 1900 was 486,732 tons, and the theoretical output for that year, based on the average of the decade 1890-1900, with 21¼% increase for 5 years from the mean of 1895, would have been 410,560 tons. It is evident that the average ratio of increase of slightly more than 4% yearly, which ruled during the Nineteenth Century, is not the factor of the present electrical age. What that factor may be is uncertain. The electrification of the globe, while wonderful progress has been made, is not yet a sufficiently established fact to give accurate data for an average ratio of increase in consumption.

The ratio of increase in copper production of the world has been 6% to 8% for several years past. It has grown to be considered an axiom in the copper trade that the normal increase is 8% yearly, but this ratio, while it may be considered the present factor, has not been established for a sufficiently long time to be assured for an indefinite time in the future. The following table gives hypothetical outputs for every tenth year during the Twentieth Century, based upon various percentages of increase, all figured from the actual production of the closing year of the Nineteenth Century. The compound increases, for facility in computation, are taken at slight changes from their actual value, as, for instance, 4% compounded for ten years is figured as 50% increase, instead of 48.02%, the actual figure; 5% is figured at 60%, instead of 62.89%; 7% compounded is figured as 80% in ten years, instead of 79.02%; 8% is figured as only 110% instead of 115.89.

(Long Tons.)

Year.	At 4%.	At 5%.	At 7%.	At 8%.
1900.....	486,732	486,732	486,732	486,732
1910.....	730,098	778,771	876,117	1,022,137
1920.....	1,095,147	1,246,033	1,577,011	2,146,488
1930.....	1,642,720	1,993,654	2,838,621	4,507,625
1940.....	2,464,080	3,189,846	5,126,317	9,466,012
1950.....	3,696,121	5,103,754	9,227,372	19,878,626
1960.....	5,544,181	8,166,007	16,609,269	41,745,115
1970.....	8,316,272	13,065,612	29,896,685	87,664,741
1980.....	12,474,408	20,904,980	53,914,033	184,095,956
1990.....	18,711,613	33,447,968	97,045,260	386,601,507
2000.....	28,067,419	52,516,748	174,681,468	811,863,165

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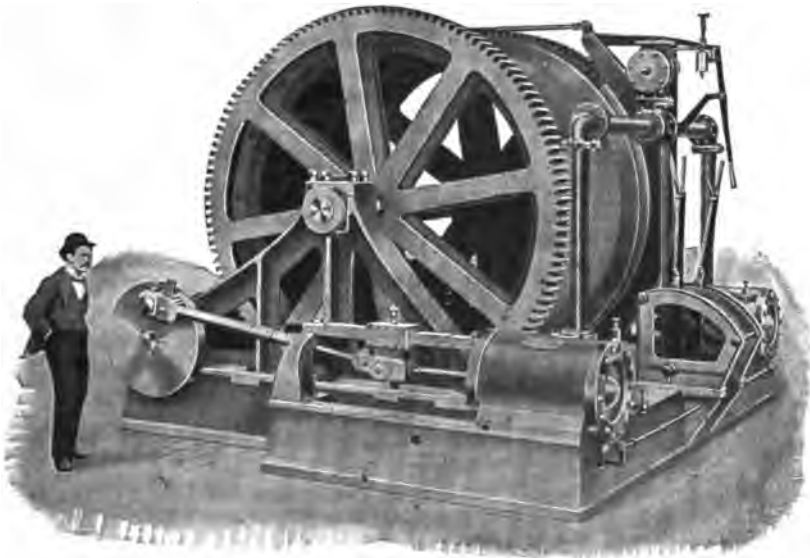
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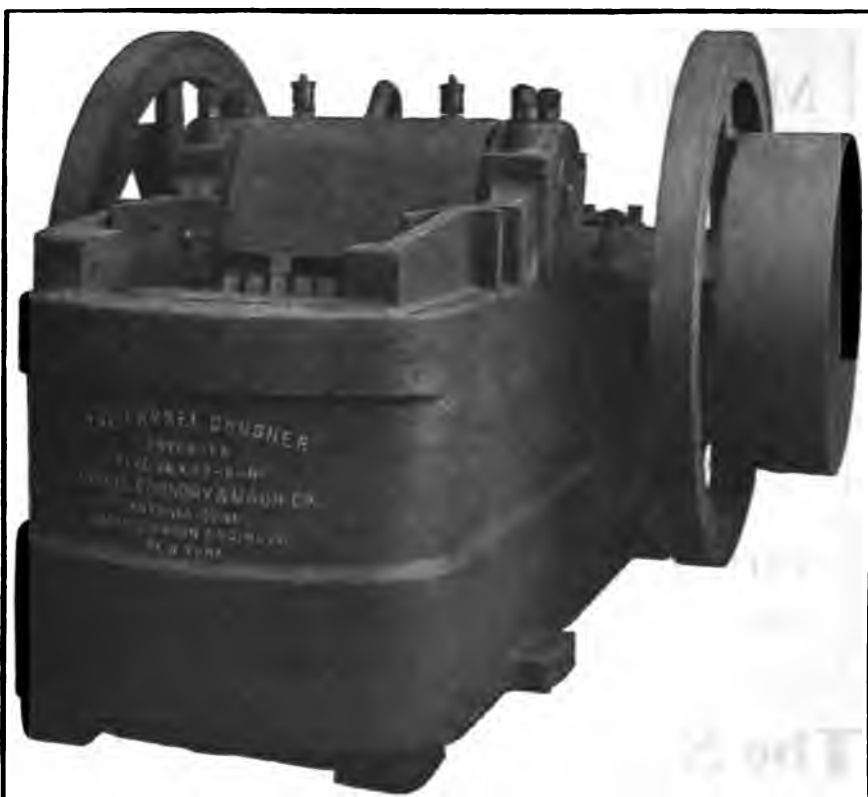
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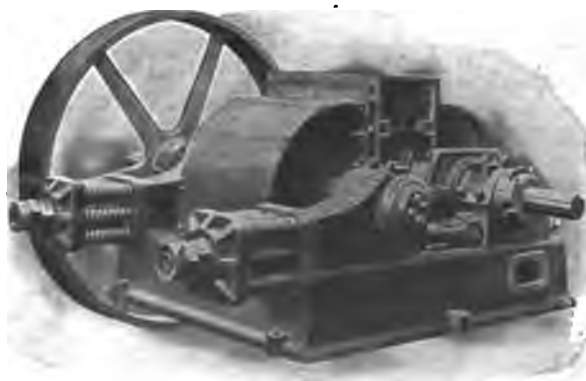
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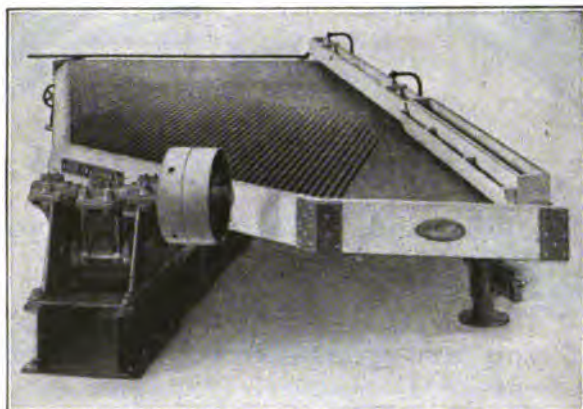
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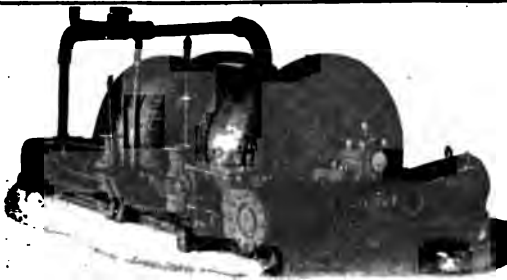
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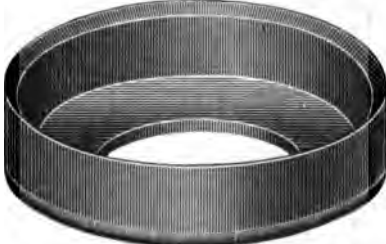
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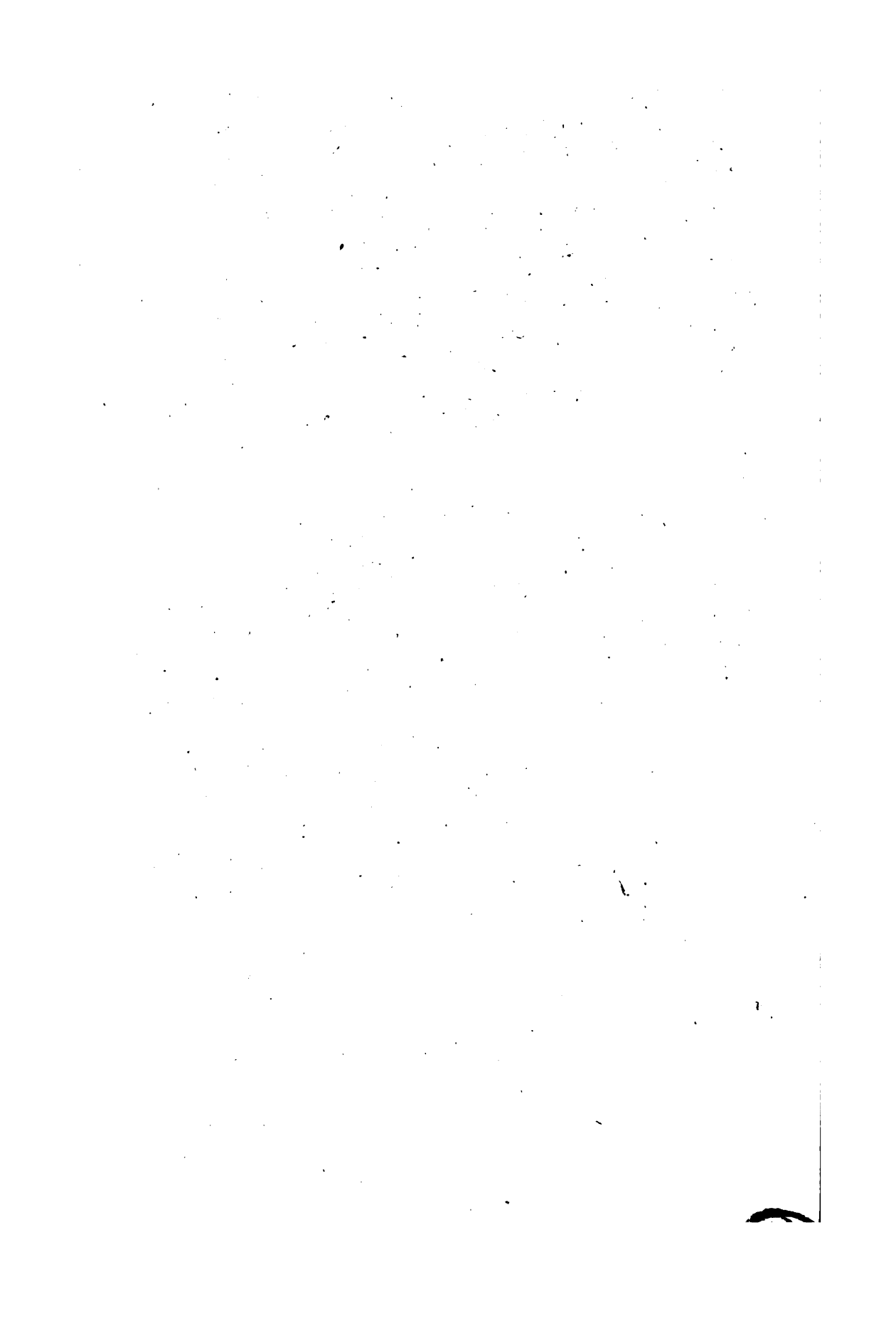
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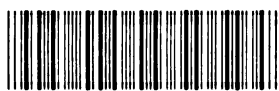
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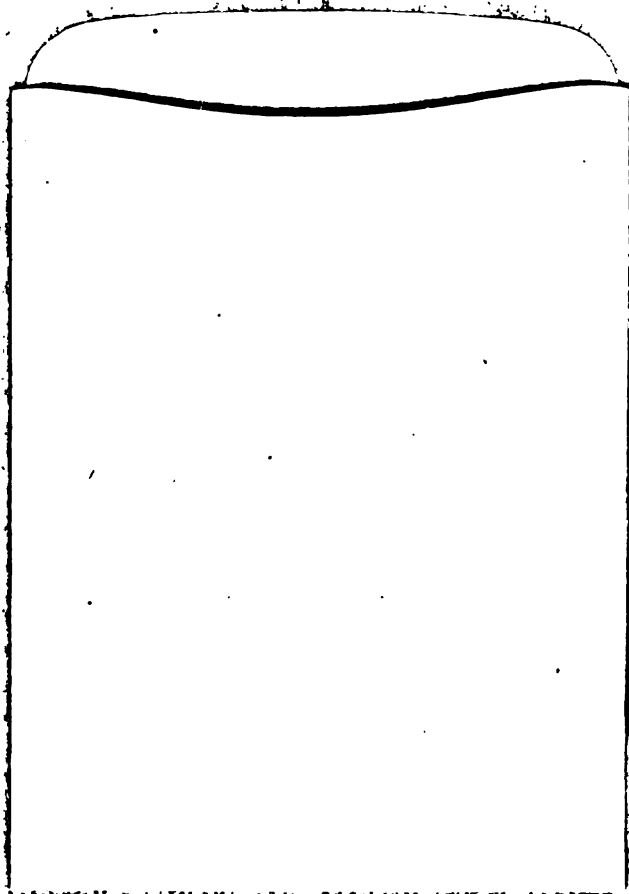


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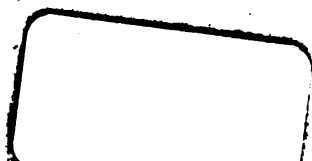
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